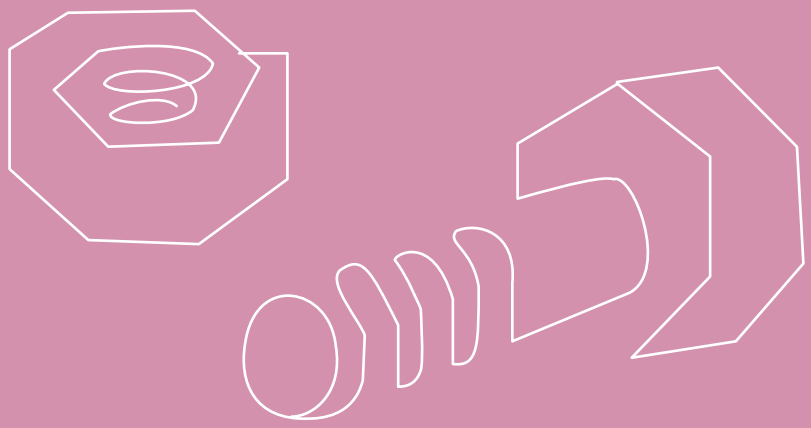
POST-PRIMARY

Technology Education

Guidelines for Teachers of Students with

MILD

General Learning Disabilities



NCCA
National Council for Curriculum and Assessment
An Chomhairle Náisiúnta Curaclaim agus Measúnachta

Contents

Introduction

Introduction

The guidelines are designed to support the technological area of experience in the context of a whole school plan for students with mild general learning disabilities.

In addition to the guidelines presented here, similar materials have been prepared for teachers working with students accessing the Primary School Curriculum. Continuity and progression are important features of the educational experience of all students; for students with special educational needs they are particularly important. Therefore, all the exemplars presented here include a reference to opportunities for prior learning in the Primary School Curriculum.

In *Approaches and methodologies* individual differences are emphasised, and potential areas of difficulty and their implications for learning are outlined and linked with suggestions for teaching strategies.

The exemplars in these guidelines draw on the Junior Certificate syllabuses for Metalwork, Materials Technology (Wood), Technical Graphics, and Technology. These subjects have particular significance for the practical and psychomotor area of experience, as well as for creativity and communication.

The exemplars have been prepared to show how students with mild general learning disabilities can access a broad and relevant curriculum through differentiated approaches and methodologies. It is hoped that these exemplars will enable teachers to provide further access to the remaining technological areas of the curriculum. A strong emphasis is placed on using an active approach to learning while using concrete experiences that relate to the student's environment and prior learning. A range of assessment strategies is identified in order to ensure that students can receive meaningful feedback and experience success in learning. Advice on health and safety is central to each activity.

Approaches and methodologies

All students benefit from a variety of teaching styles and classroom activities. Students with mild general learning disabilities will benefit, particularly if the teacher is aware of their individual talents, strengths and needs before embarking on a new activity.

Consultation with and/or involvement in the Individual Education Planning process as well as teacher observation will assist the SPHE teacher in organising an appropriate learning programme for students with mild general learning disabilities. Such an approach will assist the teacher in selecting suitably differentiated methods for the class.

Individual differences in talents, strengths and needs

If learning activities are to be made meaningful, relevant and achievable for all students then it is the role of the teacher to find ways to respond to students' diversity by using differentiating approaches and methodologies. This can be achieved by:

- ensuring that objectives are realistic for the students
- ensuring that the learning task is compatible with prior learning
- providing opportunities for interacting and working with other students in small groups
- spending more time on tasks
- organising the learning task into small stages
- ensuring that the language used is pitched at the students' level of understanding and does not hinder their understanding of the activity
- using task analysis, outlining the steps to be learned/completed in any given task
- posing key questions to guide students through the stages/processes, and to assist in self-direction and correction
- using graphic symbols as reminders to assist in understanding the sequence/steps in any given task/problem
- modelling task analysis by talking through the steps of a task as it is being done
- setting short and varied tasks
- creating a congenial learning environment through the use of concrete, and where possible, everyday materials, and by displaying word lists and laminated charts with pictures.

▲ Potential area of difficulty	= Implications for learning
Health and Safety. Delayed functional response to potential hazards. Slow response to potential hazards when using machines.	• Students may never have been exposed to a practical environment and their response to a potential danger may be slower than expected. • It may be necessary to adjust work areas to match students' optimum comfort and operational functioning.

+ Possible strategies

- Strong emphasis is needed on safety and building up students' confidence to participate in the practical environment.
- Keep all exits and pathways clear. Evacuation drill should be practiced regularly, at least once a term.
- Students should practice turning on and off machines and must know where the main power switches are and be able to use them.

▲ Potential area of difficulty	= Implications for learning
Interpreting measurements and marking out shapes	• Students may be unable to get past a critical stage and loose interest. • Students may find templates to be of help when marking out is proving difficult.

+ Possible strategies

- Careful observation of pupils experiencing difficulty and offering appropriate intervention as required.
- Using templates to mark out shapes that have complex geometric constructions.
- Using jigs to hold materials when cutting. (This can speed up the time for manufacture.)

▲ Potential area of difficulty	= Implications for learning
Fear of using new tools and machines	• Health and Safety is of the utmost importance. • The students must be confident that they can use a tool or machine safely.

+ Possible strategies

- Students need opportunities to practise and develop skills with security and confidence.
- Strong emphasis is needed on accuracy and on the practise of correct procedure.
- If using group work ensure that roles in the group are clearly assigned, and that the task is sufficiently structured to support the participation of students with motor difficulties.
- Technical vocabulary will require extra reinforcement through the use of cards, posters, etc.
- Use small pieces of waste plastics to give the student practice at marking, cutting, drilling, and bending.

▲ Potential area of difficulty	= Implications for learning
Developing ideas for a solution to a brief	Students can be encouraged to research/analyse many existing product designs and could suggest small changes to them in reaching their own solution.

+ Possible strategies

- An emphasis should be placed on keeping the ideas as simple as possible.
- Draw all ideas on the blackboard.
- Students should be encouraged to create their own models.
- Common everyday objects should be available for examination.
- Teacher-led whole class discussion, small group work and pair work is recommended.

▲ Potential area of difficulty	= Implications for learning
Abstracting and generalising	Students may find it difficult to transfer knowledge from one task to another.

+ Possible strategies

- The learning process should be broken down into short sequential steps.
- Work done should be reinforced through over-learning and repetition.

▲ Potential area of difficulty	= Implications for learning
Communicating ideas	Students may not participate in every stage of the design, and may not get the opportunity to develop their own responses to the design brief.

+ Possible strategies

- Encourage student talk through listening to other students' contributions. Allow plenty of time to answer. Do not talk for the student.
- Emphasise that every solution is useful and can lead to the final design chosen.
- Break class into pairs or threes and encourage contributions from all.
- Encourage statements of preference for various solutions, for example, *'What I like'*, *'What I don't like'*.

▲ Potential area of difficulty	= Implications for learning
Being overwhelmed by the learning process	The student becomes overwhelmed when presented with new information or skills and consequently cannot learn.

+ Possible strategies

- Differentiation of resource materials, for example, some students compare the common items (like egg holders) while others use magazine pictures.
- Differentiation of teaching style, for example, use of more discussion at both the beginning and end of the lesson to help both teacher and student to understand how they are learning.
- Differentiation of learning response. The same activity can often be done with a group or the whole class but, some students will answer orally, some by using symbolic representation, and some by using a pictorial response.
- Differentiation of learning task. One group or individual may only have to do two tasks whereas others may have to do ten or more. Set personal targets for the students so that they do not feel that others are getting less to do than they are.

▲ Potential area of difficulty	= Implications for learning
Following instructions	The student becomes confused when faced with more than one instruction at a time.

+ Possible strategies

- Get the student to repeat the instruction(s).
- Give short, clear instructions, and use pictorial cues.
- Giving verbal/written hints, for example, use graph paper, ask *'What kind of problem is it?'*, *'What do I need to know?'*, *'What do I do next?'*.
- Present clear guidance on how and when assistance will be given by the teacher/other students during the lesson.

▲ Potential area of difficulty	= Implications for learning
Reading	• Reading difficulties can prevent the student from engaging with mathematics. • He/she is often capable of completing the mathematical task but becomes frustrated and confused by printed words.

+ Possible strategies

- Provide alternative problems using a visual presentation of material.
- Ask the students to pick out the parts of the problem they can read and to focus on relevant information. Often there is a lot of information in a written problem which is redundant.
- Avoid presenting the student with pages of textbook problems, instead give worksheets (with diagrams) or verbally delivered instructions.

▲ Potential area of difficulty	= Implications for learning
Vocabulary/language	• The student cannot follow complex sentences or multiple meanings and may process only part of the instruction. • The student finds it difficult to verbalise what she/he is doing in the subject or to relate the vocabulary of the technologies to real life situations.

+ Possible strategies

- Identify and target language specific to this subject area, ensuring that it is reinforced in different contexts and in other areas of experience, both in and out of school.
- Encourage students to use relevant terms where appropriate, for example, naming tools or actions.
- Communicate clearly to both students and parents the language that is being covered each week, for example, by using a note in a copy, a wall chart, listing keywords of the week, building up a technologies dictionary.

▲ Potential area of difficulty	= Implications for learning
Motor skills and dexterity	• Students can easily become frustrated when they cannot hold a piece of material or assemble small parts together.

+ Possible strategies

- Demonstrate clearly.
- Post step by step instructions near machines.
- Keep instructions short and clear and repeat them often.
- Use clamps to hold down materials.
- Use a *'lazy hand'* to hold items for soldering.
- Allow one student to hold components while the other solders.
- Give students plenty of waste pieces to practise on at first in order to increase thier confidence.
- Use jigs to hold materials when cutting. This also speeds up the time for manufacture.

▲ Potential area of difficulty	= Implications for learning
Writing up a design portfolio	• Students may find it difficult to write up the longer passages of the design portfolio where a description of the whole design process is required.

+ Possible strategies

- The teacher can photocopy a design portfolio template using the required headings.
- The student should complete each step in the design portfolio as it is being done.
- The computer could be used for word processing if the student finds this easier than writing.
- The student should be encouraged to sketch and glue in pictures, etc.

▲ Potential area of difficulty	= Implications for learning
Short attention span, lack of concentration and application	• Students may have difficulty in completing the design brief. • Students may find it difficult to stay on task, may take a long time to complete a task, or may rush a task. • The standard of finished work may be poor.

+ Possible strategies

- Interesting projects that require a short time scale should be chosen in the early stages.
- Vary the processes and move students to new and achievable tasks if concentration is seen to diminish.
- Students may not be able to choose an appropriate process and may need help with part of the application of the process.
- Group/pair work and division of tasks can help to hold interest, as projects can be done jointly in a shorter time span.

▲ Potential area of difficulty	= Implications for learning
Poor self-esteem and a fear of failure	• Students may feel a sense of helplessness and may constantly seek help or refuse to proceed with even the simplest of tasks. • Students may get trapped in the *'I can't do this subject'* syndrome.

+ Possible strategies

- It is important that students experience success as often as possible.
- The teacher and the student should negotiate realistic and achievable targets.
- Tasks should be relevant to the students' day-to-day reality and have a clear meaning and purpose to them.
- A classroom culture should be developed in which mistakes are seen as an integral part of the learning process.

Exemplars

The exemplars presented here are designed to show how the strategies outlined can work in classrooms, and to model practice that can meet the needs of junior cycle courses and serve the particular learning needs of students with mild general learning disabilities.

Structure

Each of the exemplars is preceded by a summary in the form of two tables. The first table is an introduction to the exemplar. It outlines the relevant sections of the *Primary School Curriculum*, *Junior Certificate* (Ordinary level) and *Junior Certificate School Programme* (JCSP). It also highlights some of the characteristics of students with mild general learning disabilities that relate specifically to the area covered in the exemplar and lists some of the strategies used. In addition, a time scale and a list of resources are provided. The second table outlines the exemplar in more detail by providing suggested outcomes, supporting activities, and assessment strategies for a lesson/series of lessons. The tables are common to all areas of experience and are summarised below.

Exemplars

No.	Syllabus topic	Exemplar title	Page
1.	Technology: Design procedure	Design and make an egg holder	12
2.	Technology: Design procedure	Electronic Steady Freddie	27
3.	Materials Technology (Wood): Project design and realisation	Design and make a desktop-tidy	38
4.	Metalwork: Techniques and design	Make a key tag	60
5.	Metalwork: Techniques and design	Make a seesaw	79
6.	Technical Graphics: Descriptive geometry	Patterns	82
7.	Technical Graphics: Descriptive geometry	Orthographic projection	90

Exemplar 1: **Technology Education**

Syllabus topic: Technology: Design procedure	**Statement of the brief:** Design and make an egg holder for holding a soft boiled egg and which can be stacked neatly on other holders when not use.

Primary School Curriculum (5th and 6th classes)	Junior Certificate (Ordinary level)	Junior Certificate School Programme
Science Strand: Designing and making Strand: Materials	**Design procedure:** Problem identification Research of information Conceptualisation and modelling Production Evaluation	**Design brief:** Compile a design brief for a selected technology project

Time scale

Activities 1a (1-6) one class for each activity.

Activities 1b (1-9) may take up to 10 classes to complete.

Activities 2 (1-5) may take up to 7 class periods.

Activity 6 may take up to 10 class periods as in *Activity 1b*.

Potential areas of difficulty

- Confusion with symbols and signs.
- Poor psycho-motor skills.
- Lack of confidence.

Strategies used in this exemplar

- The teacher supports students in completing a particular task.
- The teacher uses resources, a such as a drawing board, a grid, and isometric paper to aid drawing.
- Students are encouraged to develop their own ideas.
- Students are allowed practice each new process until skilled enough to proceed to the next process.
- Students work at their own pace.

Resources

- Wall charts of tools and machines.
- The safety requirements displayed over each machine, for example, the drill.
- A design loop displayed on the wall to help students to remember the sequence of steps.
- Workshop tools, basic electronic components, a variety of plastics and metal rods.
- ICT resources can help the student in recording what has been achieved. There are commercially available packages which teachers and students may find helpful.

Exemplar 1: **Technology Education**

Suggested outcomes	Supporting activities	Assessment strategies
As a result of engaging in these activities students should be enabled to **1a** • understand the need to work safely in an organised way • be able to analyse a given brief • communicate with members in a group • identify common solutions already on the market • choose a good design solution and give a reason for choosing it • draw a simple freehand sketch or describe the idea in words. **1b** • use basic drawing instruments to draw shapes accurately • make a paper model • mark out shapes from a template • use hand tools to cut, form and finish a basic shape • use a drilling machine to drill a hole safely • bend the material into shape using a former, and finish • evaluate final artefact • use a design portfolio template to write up the project.	Students: • identify workshop rules, and understand and follow safety procedures • use a table to break down the design brief statement into identifiable units • use brainstorming to arrive at a specification of the brief and to make a list of objectives • use a scissors to cut out possible solutions from magazines/catalogues and make a collage • group discussion on good design. Choosing of best idea and writing a reason to justify choice. • sketch in pencil their preferred solution with simple annotation. **1b** • identify rectangles, circles, triangles, etc. • accurately draw shapes with measurements using a ruler, a setsquare, a compass, etc. • mark out, cut, and bend a paper model • mark out the shape accurately on acrylic using ruler, biro and tri-square • find the centre of the rectangle • cut out the shape using a hacksaw • drill a hole in the marked centre using a hole saw • finish the edge with files, wet and dry sandpaper, and polish • heat acrylic on a strip heater and bend it into shape using a former	• The teacher observes the readiness of students to maintain a tidy work area, and whether they can explain rules to a peer/the group. • The teacher assesses the ability of students to break down a statement and fill in a table. • The teacher assesses the ability of students to participate in a group and to communicate. • The teacher assesses choices made by students in selecting the best solutions and their ability to explain their choices. • Teacher assesses the support students need to complete a sketch. **1b** • Students self-assess their own finished shape drawings. • Students self-evaluate and grade their paper models against the brief (using a scale of assessment). • The teacher assesses the skills and accuracy of students marking out, and helps where needed. • The teacher assesses students' knowledge and use of basic tools by matching a diagram with names and functions. • The teacher and students collaborate in assessing performance in this activity throughout its process. The student flags difficulties, the teacher observes and anticipates, and both assess when the activity is finished.

Exemplar 1: **Technology Education**

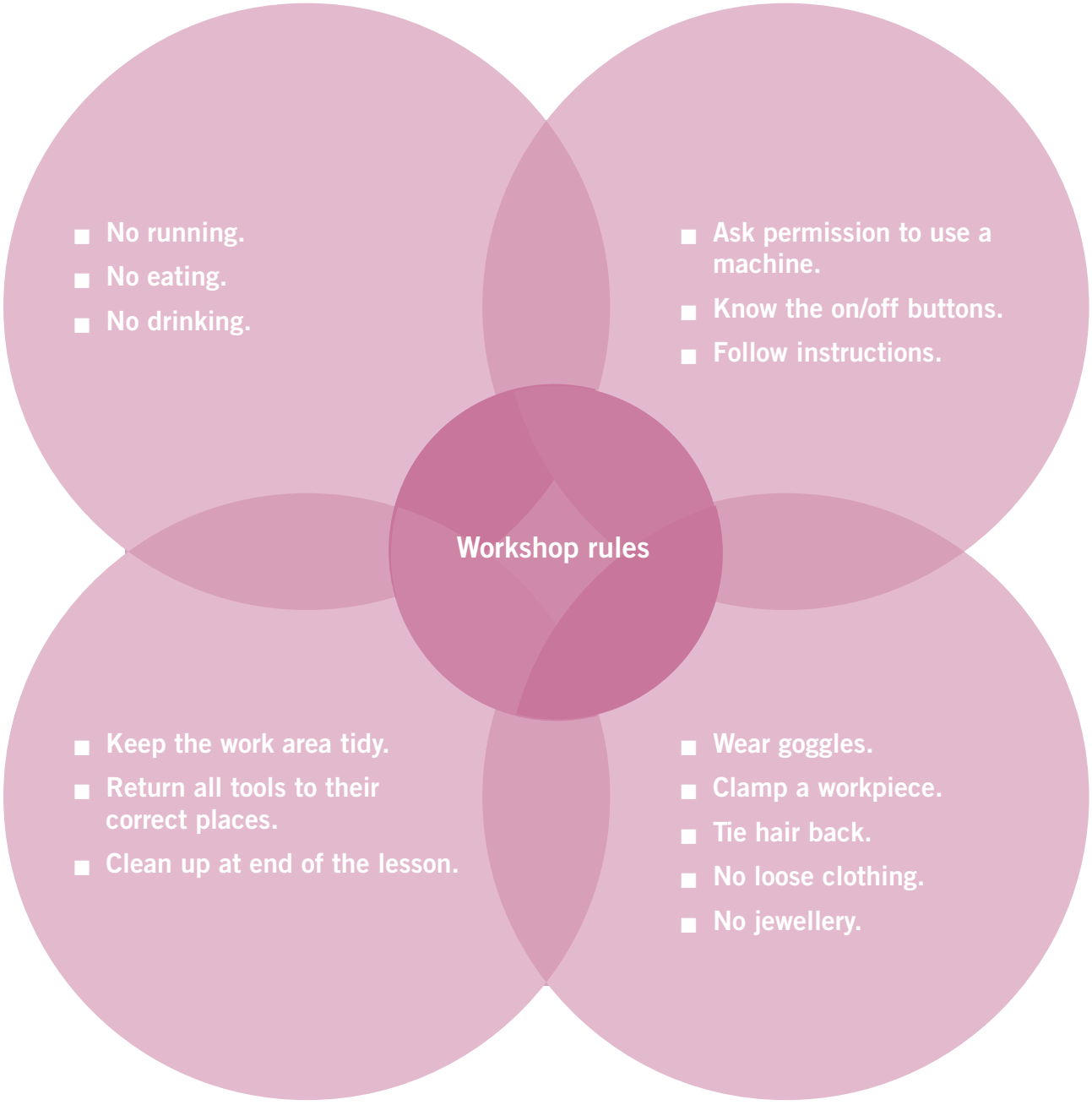
Suggested outcomes	Supporting activities	Assessment strategies
	• evaluate the final artefact against the list of objectives • record each stage in the design process, whether through a class diary and/or photos or on tape. (ICT can help and motivate students in recording activities which lead to the final product.)	• Students explain safety precautions when using the hacksaw, the drill, files, the strip heater and various materials. (teacher observation) • Students assess the quality of their own and others products, asking questions such as, *'Do they all stack on each other?'*. • Students complete an evaluation sheet and write up a list of modifications made or improvements that could be made. • Students complete the design portfolio under headings of *The design process* and the teacher assesses it. This portfolio can include an oral narrative of the different stages, drawings, class/group presentations as well as written work or as alternatives to written work.

Exemplar 1: **Technology Education**

Activity 1a

Rules and safety in the workshop

Teacher discusses rules and students suggest reasons for the rules.



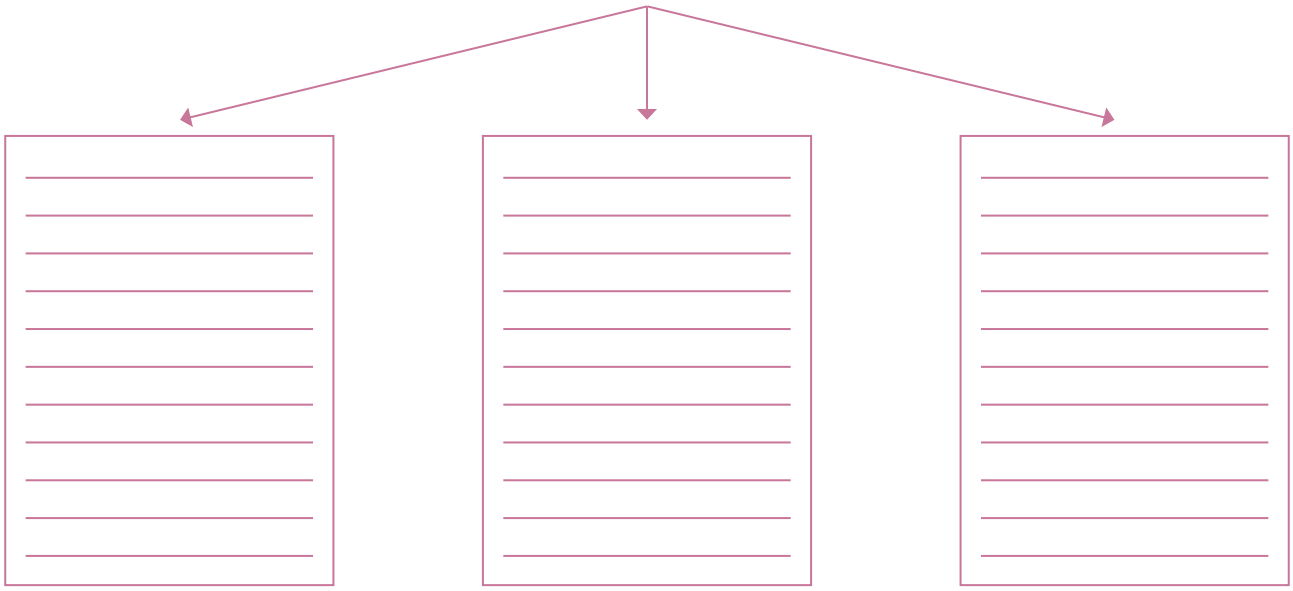
Exemplar 1: **Technology Education**

Activity 2a

Analysis of brief

The teacher explains how to break down a brief into identifiable units and the students fill in the table. The students need to practise the skill of analysing both open and closed briefs to help them understand what they are required to do.

Design and make an egg holder capable of holding a soft boiled egg and which can be stacked neatly on other holders when not in use.



Following class discussion on issues such as suitable material, hygiene, size, shape, colour, stability, etc. the group lists the objectives for the holder without stating final solutions.

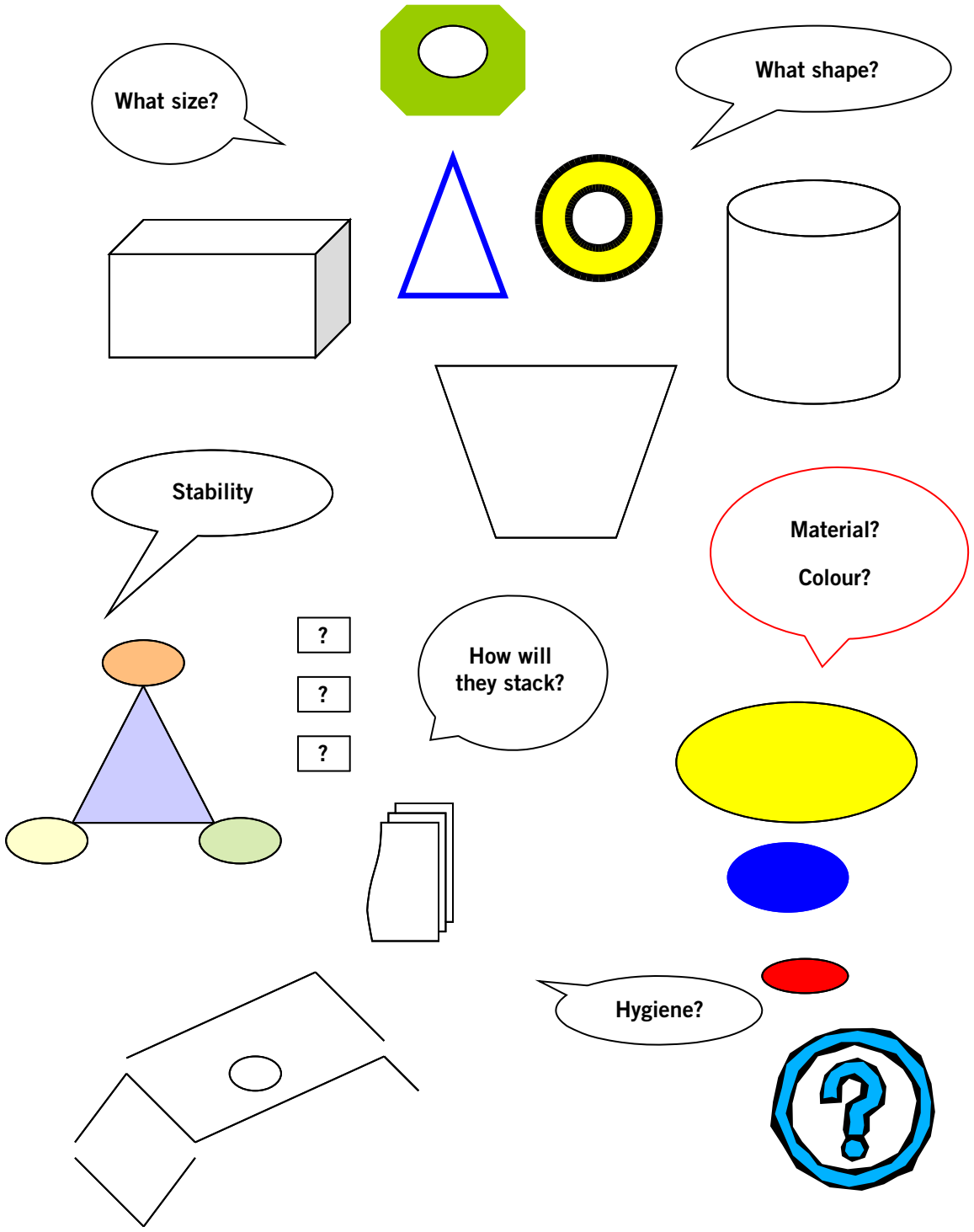
Design specification/list of objectives
•
•
•
•
•
•
•

Exemplar 1: **Technology Education**

Activity 3a

Brainstorming possible solutions

Students examine many shapes and materials. Different groups try stacking different shapes to find out who can stack the highest. Refer to how household items are stacked in a cupboard and what makes a shape stable. Plastics, metals and wood are examined to find the most suitable material as specified in the list of objectives.



Exemplar 1: **Technology Education**

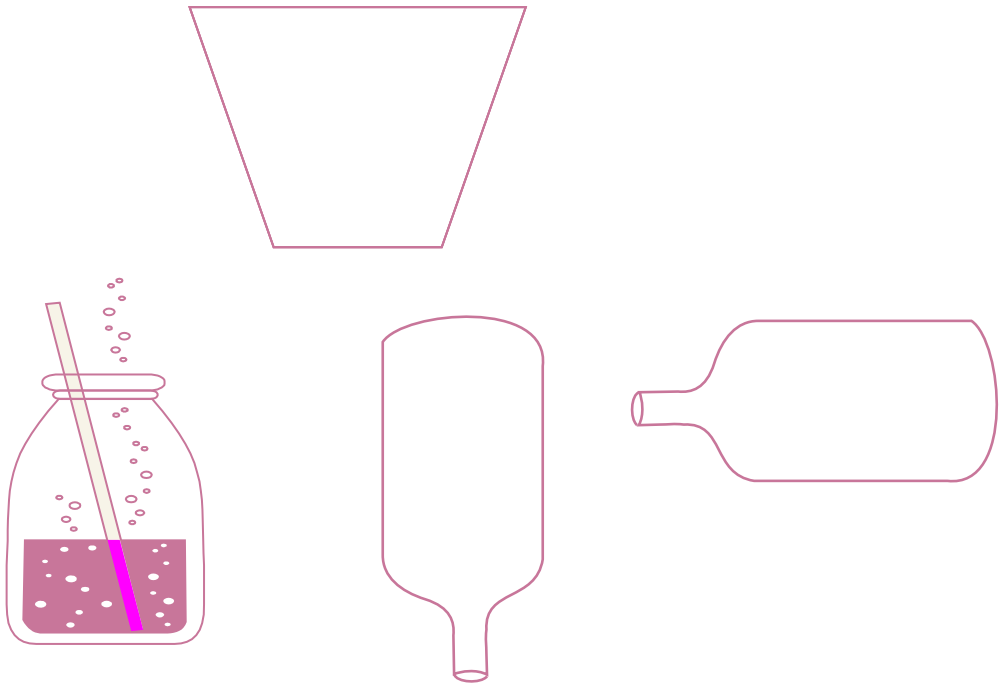
Links can be made here to Science.

How do we prevent things from toppling over?
The term *equilibrium* could be introduced and a bottle could be used to demonstrate stable, unstable and neutral equilibrium.

If appropriate, the centre of gravity of a rectangle could be found.

The idea of having a broad base and keeping the centre of gravity as low as possible could be introduced.

This will help steer the student towards the final solution.



Exemplar 1: **Technology Education**

Activity 4a

Research and investigation

The teacher makes the following items available:

- an egg
- household magazines and catalogues
- egg cartons
- samples of egg cups
- samples of coloured acrylic
- samples of metals, for example, aluminium, copper and brass
- samples of wood.

Students cut out pictures of various types of holders and egg containers using a scissors. Using adhesive each student makes a collage.

The group then examines each collage and discusses the ideas.

The teacher asks:

- Is this a good shape?
- How many would need to be stacked?
- What space would they occupy?
- What size is the egg?
- Must the holder be waterproof and washable?
- What colours are suitable?
- What material is best?

Exemplar 1: **Technology Education**

Activity 5a

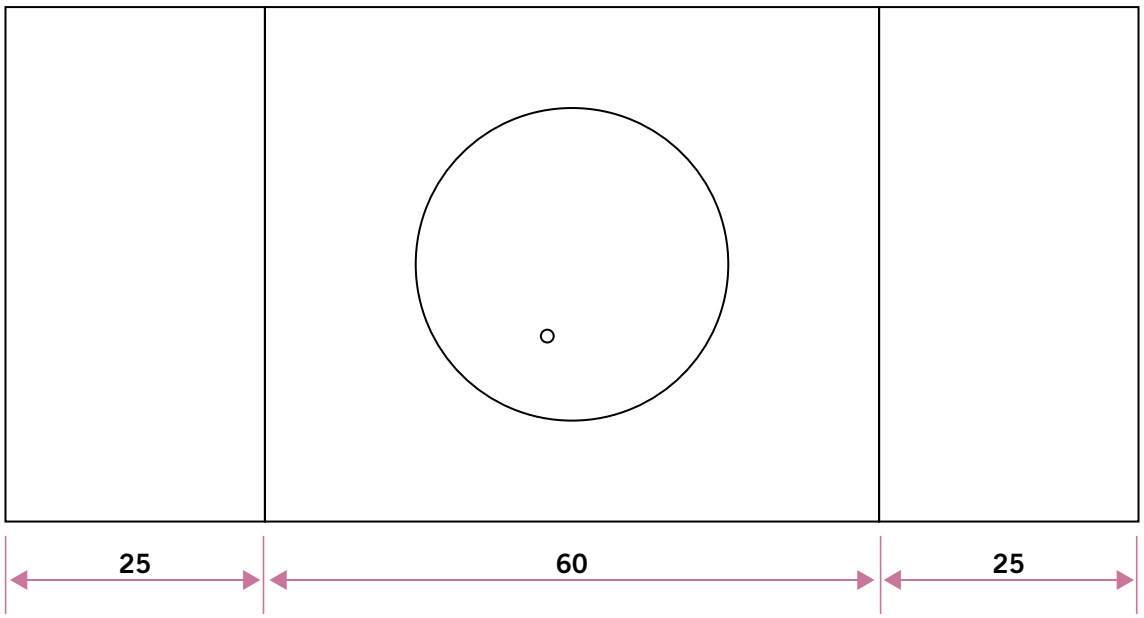
Ideas/making choices

- The students draw one or two rough sketches of their ideas using pencil.
- For students who experience difficulty in drawing 3-D sketches, grid paper or isometric grid paper can be used.
- The teacher can also draw simple sketches on the board as ideas emerge. These ideas should include the final solution so as to close down the brief.
- Each idea is then explored orally.
- Students can tick a box for each idea under given headings or place an *'X'* if it is not suitable.
- Each student then chooses the best solution based on the one with the most ticks and writes one reason why it is considered the best one.
- A consensus is reached on the final solution.
- Students are now ready to embark on the manufacturing stage.

	Idea 1	Idea 2	Idea 3
Good shape			
Neat size			
Stackable			
Washable			
Attractive			
Easy to make			

Exemplar 1: **Technology Education**

Development drawing of an egg holder



Exemplar 1: **Technology Education**

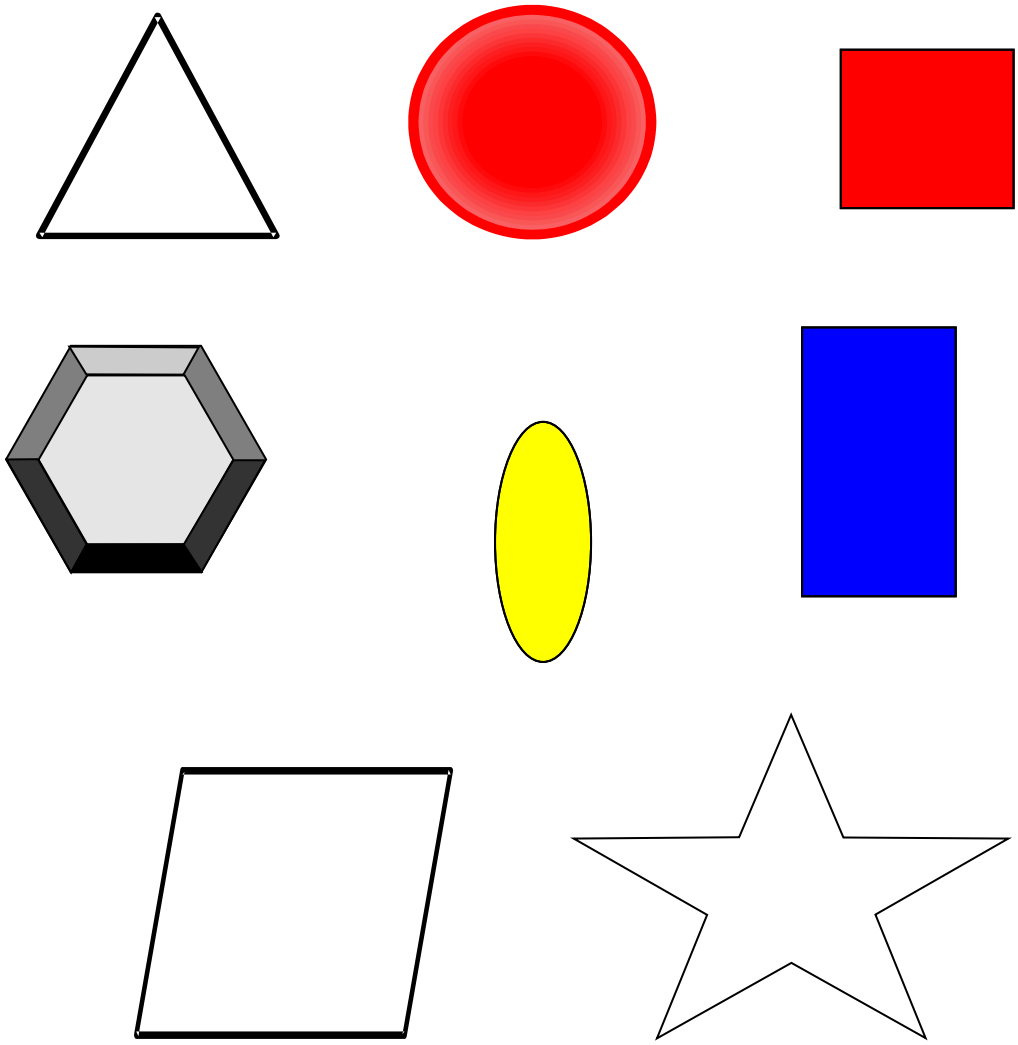
Activity 1b

Recognising shapes

Students handle a number of different shapes, squares, rectangles, squares, cubes, triangles, and ellipses. Common everyday objects found in the classroom and at home are examined. Students describe the feel of the object and relate the shape to the function of the container.

The egg could be handled and its shape described. Students could then draw a sketch of an egg shape.

Students can fill in a worksheet of common items by matching them with the names of the shapes.



Exemplar 1: **Technology Education**

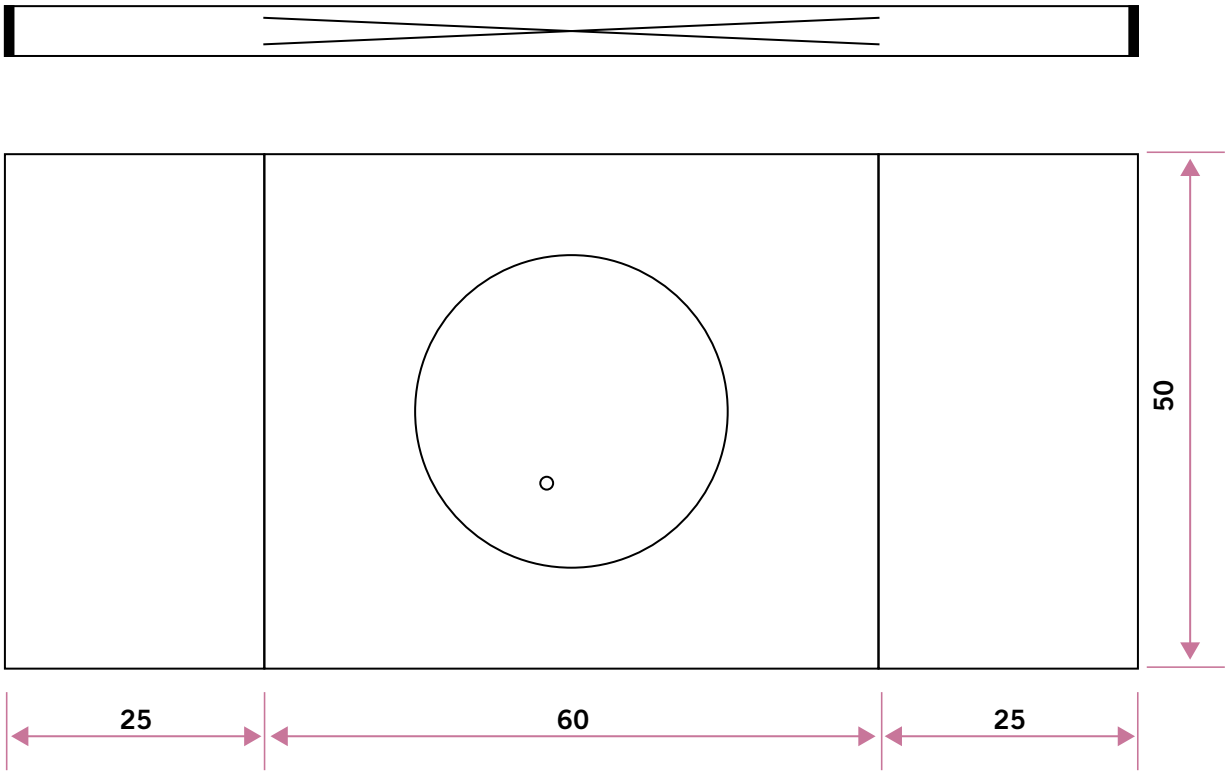
Activity 2b

Let's make a model

The teacher gives a development drawing of the egg holder to the students.

Using a setsquare, ruler, pencil, and grid paper the student draws a development drawing of the egg holder to scale. The centre and bend lines are marked. The drawing is then cut out with a scissors and bent into shape. This paper model can then be used to test that they stack neatly. It can also be used as a template for marking out on the acrylic.

Development drawing of an egg holder



Exemplar 1: **Technology Education**

Activity 3b

Manufacture

This activity involves the student in the steps of manufacturing as follows:

- marking out on the acrylic
- cutting the shape with a hacksaw
- drilling the hole with a hole saw
- filing the edges with rough and fine files
- finishing the edges with wet and dry sand paper
- polishing
- heating the bend lines on the strip heater and bending them into shape using a former made by the teacher.

This activity may need support from the teacher or classmates.

Each stage and process must be fully explained and demonstrated.

The student should practice using each tool/machine until he/she is comfortable and competent to use it safely. If the student is experiencing undue difficulty with a particular process the teacher can help complete that stage, thus enabling the student to progress to the next stage.

All safety procedures must be adhered to. This is an opportunity for the student to apply the rules learned in *Activity 1a*.

Exemplar 1: **Technology Education**

Activity 4b

Evaluation

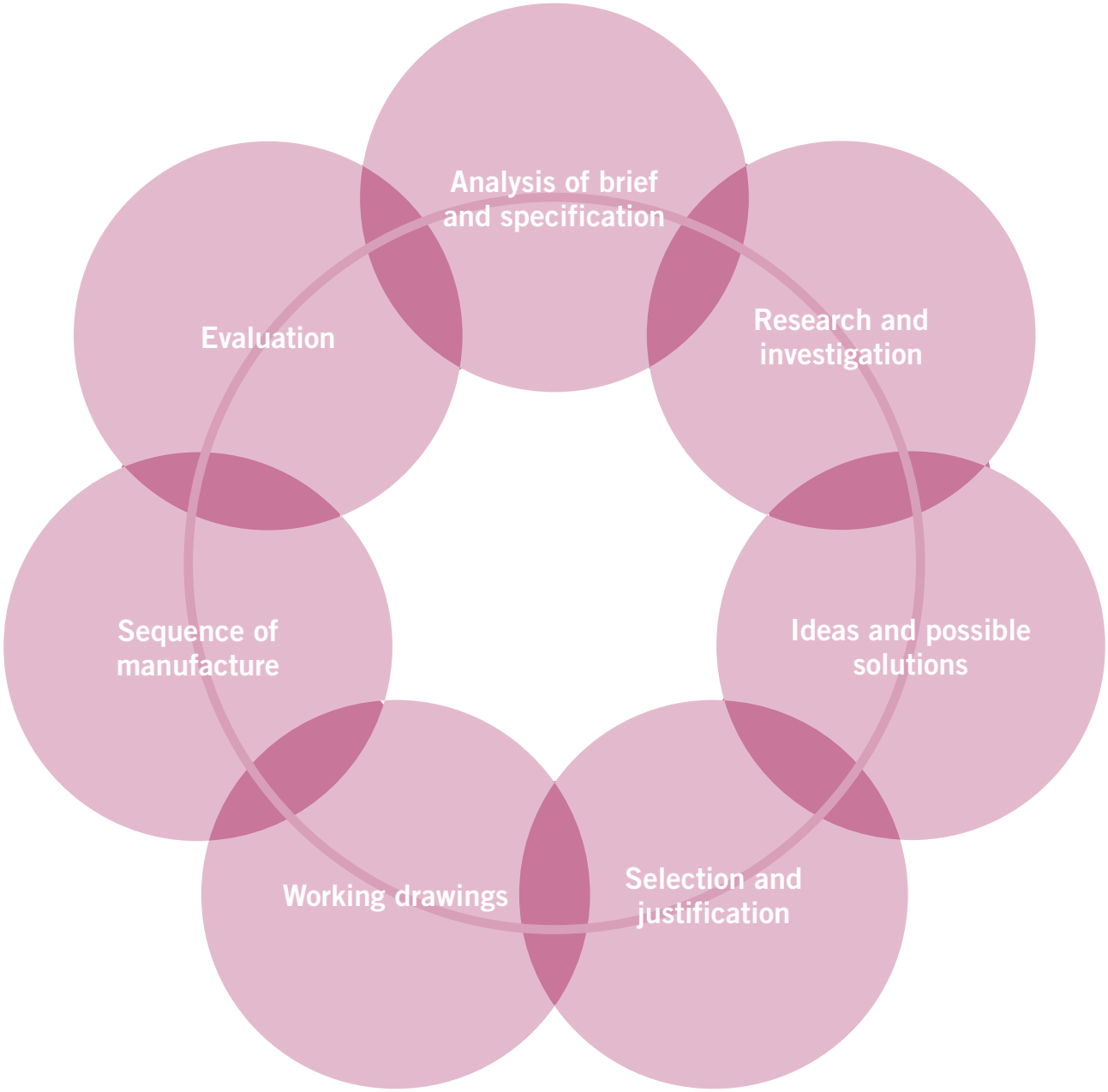
- In this activity the student evaluates his/her piece of work. It can be evaluated against the list of objectives. The teacher can also make out a list of questions to which the answer could be '*Yes*', '*No*', or '*Maybe*', which would allow students to expand the evaluation if they wish, for example,:
- Is it a holder and is it complete?
- Can it hold an egg?
- Is it steady and stable on the table?
- Does it stack on other holders?
- Is the material suitable?
- Can it be washed and is it hygienic?
- Are there any sharp edges and is it safe to use?
- Is the colour attractive and suitable for a kitchen?
- Am I pleased with my egg holder?

The student can then suggest changes or modifications that might improve the artefact.

What changes would I make if I were to do it again?

Exemplar 1: **Technology Education**

The design process



Exemplar 2: **Technology Education**

Syllabus topic: Technology: Design procedure

Statement of the brief: Electronic Steady Freddy

Primary School Curriculum (5th and 6th classes)	Junior Certificate (Ordinary level)	Junior Certificate School Programme
Science Strand: Materials Skills development: Designing and making	**Design procedure:** Problem identification Research of information Conceptualisation and modelling Production Evaluation	**Design brief:** Compile a design brief for a selected technology project

Time scale: The full range of learning and assessment presented in this exemplar may take ten to fifteen classes including double periods, if possible.

Potential areas of difficulty

- Confusing symbols and signs.
- Co-ordination.
- Understanding of new terms.
- Short attention span, lack of concentration and application.

Exemplar 2: **Technology Education**

Strategies used in this exemplar

- Invite students to name each component out loud. This may be achieved through matching activities, a wall chart to which there is regular reference, drawing, card games, puzzles, commercially available CDs, as well as through revision.
- Follow the technology room rules and follow safety procedures.
- Give good visual demonstrations.
- Use clamps to hold down materials. Use a *'lazy hand'* to hold items for soldering.
- Provide suitable group arrangements, for example, one student could hold components while the other solders.
- Restrict the area of work.
- Reaffirm good examples and practices.
- Give students plenty of waste pieces to practice on at first.
- Encourage students to keep a symbol and keyword dictionary.
- Encourage students to describe and explain new terms to each other and to the teacher.
- Design short easily accomplished tasks.
- Students negotiate individual targets with the teacher, and these can be reviewed as required.
- Some students may work well in pairs and small groups.
- Encourage learning through discovery.
- Encourage students to keep records of work, skills, achievements, and the completion of tasks in a folder. This can be done by using photographs, drawings, verbal records, and check lists provided by teacher that the students can tick.

Resources

- Electronic components and symbol cards, soldering materials and equipment.
- ICT software like *'Investigating Science'* has useful activities in electrical circuits.

Linkage

- **Science:** electronics, circuits, voltage, switches, electrical circuits and currents.
- **English:** preparing for and conducting an interview.
- **History:** children's toys in the past. (An extension of the interview about childhood toys with parents/older people could link personal experiences with this project.)
- **Home Economics:** stages of child development.

Exemplar 2: **Technology Education**

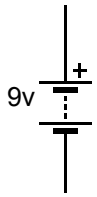
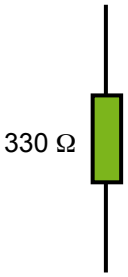
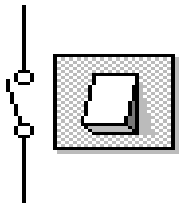
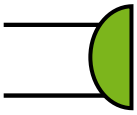
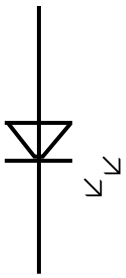
Suggested outcomes	Supporting activities	Assessment strategies
As a result of engaging in these activities students should be enabled to • apply the design process to the given brief as in *Exemplar 1* • do research to define a brief • recognise the symbols for basic electrical components • connect components together to complete an electrical circuit • display an understanding of how circuits work • solder the components together and assemble the circuit into the manufactured artefact • understand the terms voltage, current and resistance (if the student wishes to develop her/his toy further) • evaluate the finished product in terms of the design brief.	• Students match electronic symbols with the following components: switches, battery, bulb, buzzer, LED, and resistor. • Students build simple circuits using a temporary connection or veroboard. • Students use simple circuit diagrams (either drawn freehand or using a computer program, for example, *crocodile clips*). • Students design a questionnaire to conduct an interview with a five year old child. • Students manufacture the base for the toy and solder the chosen circuit. • Students evaluate the work they have done.	• The teacher assesses the ability of students to recognise symbols, and checks on the support they need to complete and test a circuit. • The teacher monitors the ability of students to transfer schematic drawings of symbols into real component circuits. • Students fill out a worksheet on how circuits work. • Students write in the results of each circuit built. • The teacher assesses the students' readiness and confidence in suggesting suitable questions for the questionaire. • The teacher and students collaborate in assessing this activity. Students flag difficulties, the teacher observes and anticipates, and both assess when it is finished. • Students assess the quality of their own and other's work. • Students evaluate the finished artefact. • Students complete the design portfolio under headings of *The design process* and the teacher assesses it. This portfolio can include an oral narrative of the different stages, drawings, class/group presentations, as well as written work or as alternatives to written work.

Exemplar 2: **Technology Education**

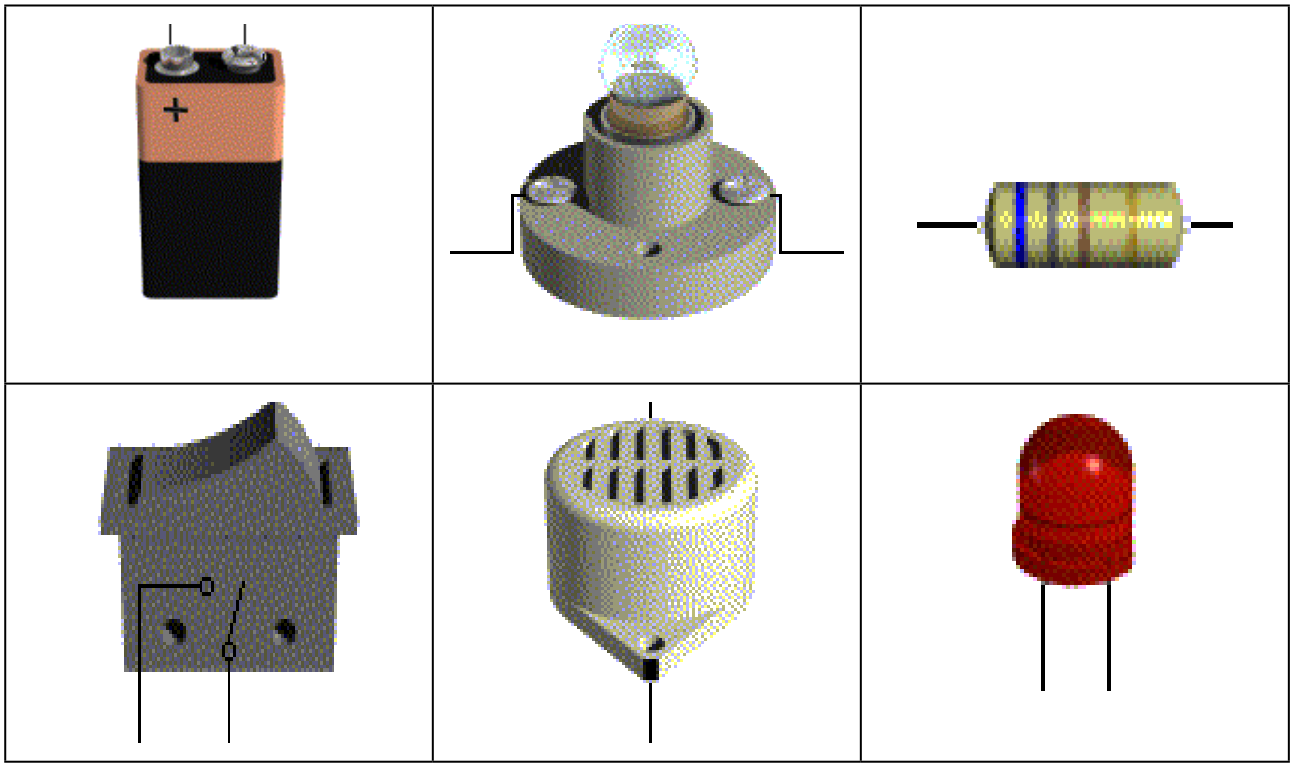
Activity 1

Electrical symbols: what is this?

In this activity the student is shown real components and given the symbol for each one. They practise drawing the symbols. Separate cards are made of pictures of the components and the symbols. Students matches each symbol card with the component card.

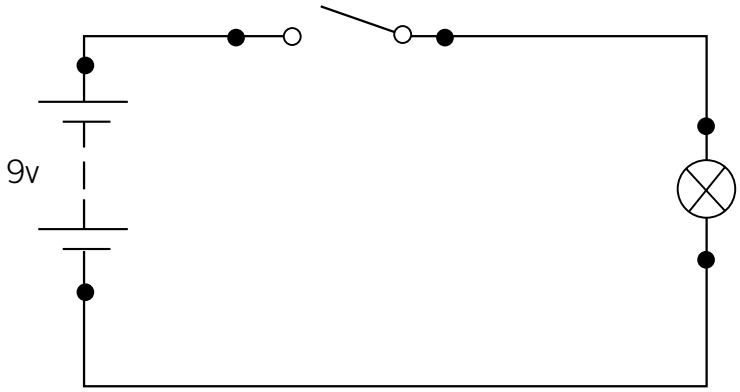
Exemplar 2: **Technology Education**

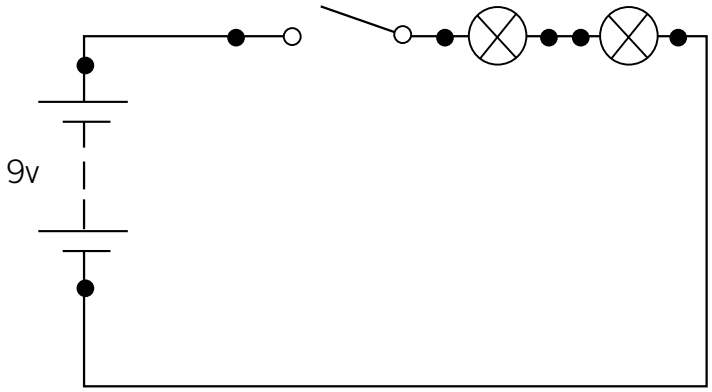


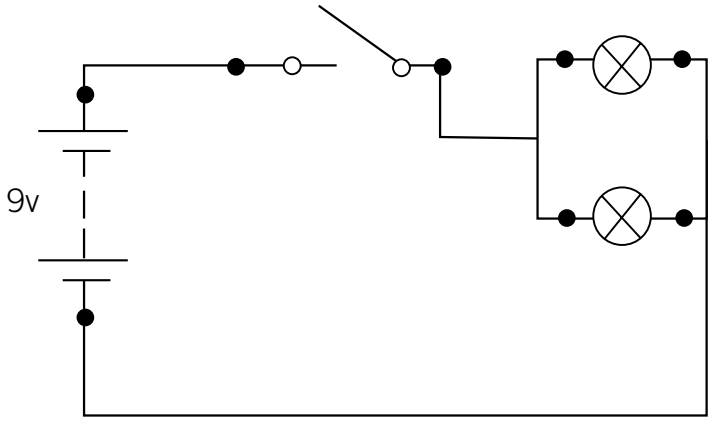
Exemplar 2: **Technology Education**

Activity 2

In this activity students are given a battery, a battery clip, a switch, two bulbs, and wire. They experiment with joining them together temporarily to complete a circuit loop. A worksheet of circuit drawings is then introduced to allow them to build the basic circuits and write down what happens in each case. The students learns by discovery. This activity reinforces the learning of the symbols and the transfer of the schematic drawing into a real life circuit.

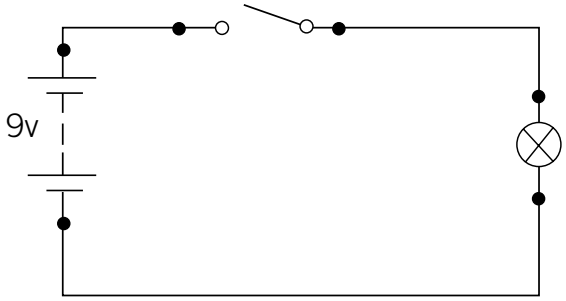


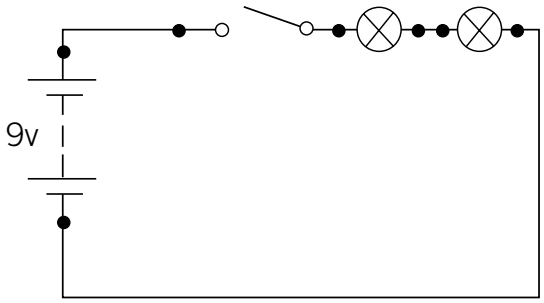


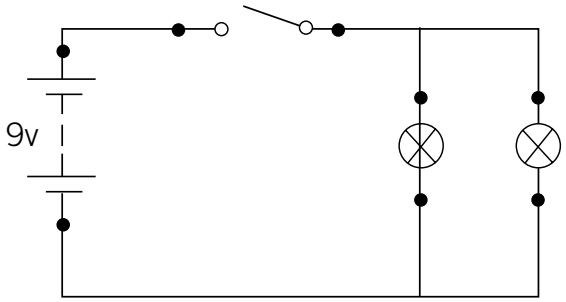


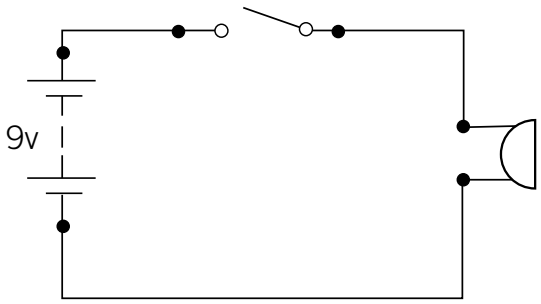
Exemplar 2: **Technology Education**

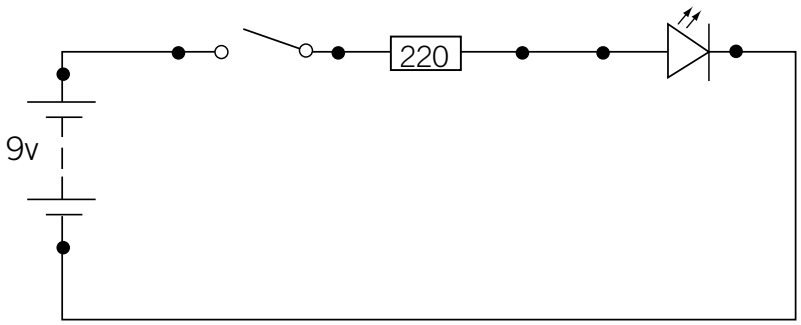
Activity 3 **Build the following circuits and describe what happens when the switch is closed**











Exemplar 2: **Technology Education**

A.	When the switch is open the bulb does/does not light. When the switch is closed the bulb does/does not light. Bright/dim/no light?
B.	When the switch is closed both bulbs light/do not light. Bright/dim/no light? When one bulb is removed the other bulb does/does not light. Where at home would you find this arrangement?
C.	When the switch is closed both bulbs light/do not light. Bright/dim/no light? When one bulb is removed the other bulb does/does not light. Where at home would you find this arrangement?
D.	When the switch is closed what do you notice? What happens if you connect the buzzer around the other way? What would a buzzer be used for?
E.	Does the LED light when you connect it up as in the drawing? Does it light if you connect it around the other way — short leg to + of battery? What does the resistor do in the circuit? Where at home would you find LEDs?

Exemplar 2: **Technology Education**

Activity 4

The interview

In this activity the student prepares a questionnaire to interview some five year old children to research what kind of electronic toys the children like to play with. Some questions can be pre-prepared while others can be open with blank spaces for filling in responses.

In designing the questionaire the student needs to reflect on:

- What questions will I ask?
- What do I need to know that will help me design my Steady Freddie?

The teacher can hand out a worksheet with suitable words. The student designs the questionnaire around the following words:

Fun

Games

Playing with others?

Colours

Lights

Sounds

Buzz off.

Following the interview the student must analyse the responses received.

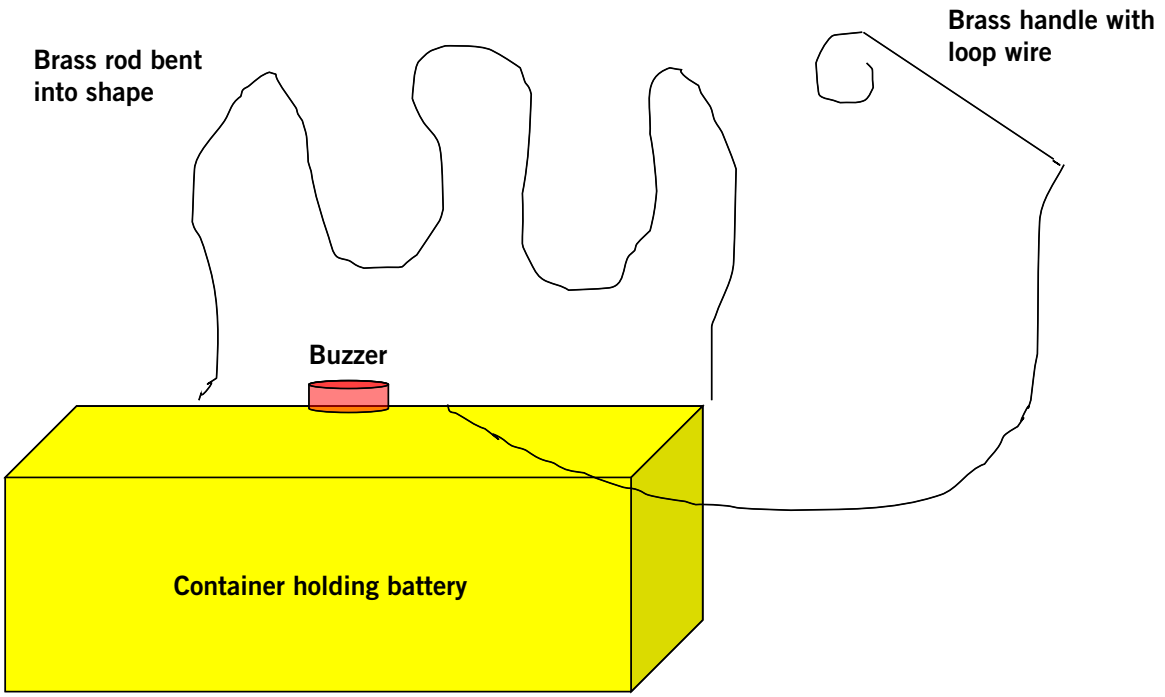
This will help the student to develop ideas for a game that would be suitable.

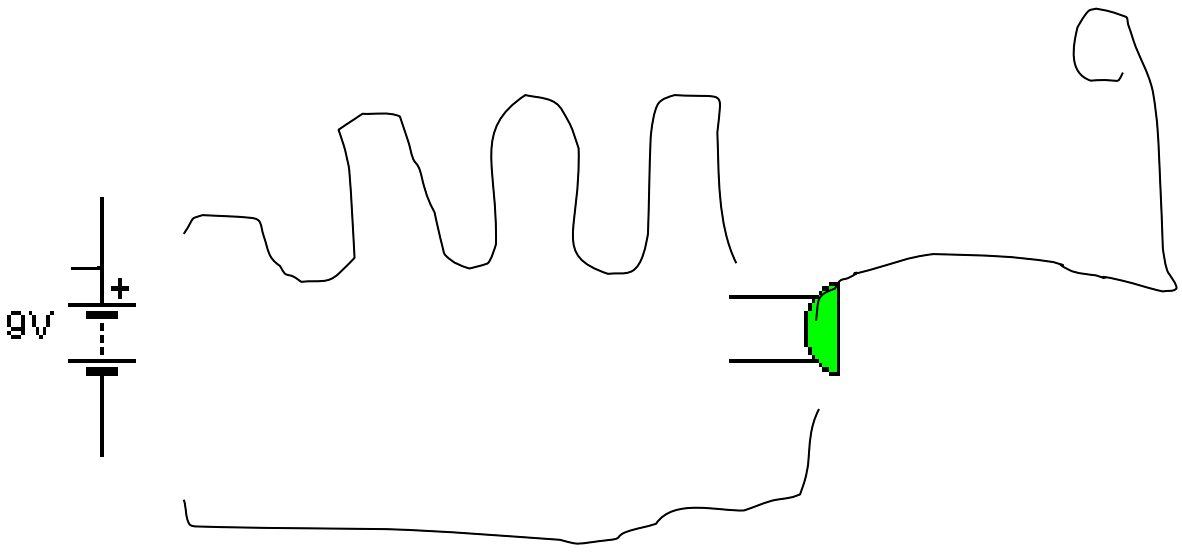
Exemplar 2: **Technology Education**

Activity 5

Buzz off Steady Freddy

The student follows the design process as in *Exemplar 1* to manufacture a shape for the Steady Freddy. The same shape as the egg holder or a recycled container could be used, thus allowing the student to spend more time on the electronic circuit if this is necessary. Alternatively, designing and making a new shape will reinforce the skills already learned. The student solders the basic components and can test the circuit. Some students may wish to incorporate a time delay in the circuit by using a capacitor and resistor. Others may want to add lights as well as sound.





Exemplar 2: **Technology Education**

Resources

Interview worksheet

Favourite toys	Fun
Friends	Cartoons
Colour	Lights
Noise	Shapes

Here are some things you may want to find out about five year olds.

Now you can write your questions, starting with:

- What is your favourite toy?
- Why do you like it?
- Now add one of the words above.

Exemplar 3: **Technology Education**

Syllabus topic: Materials Technology (Wood): Project design and realisation

Statement of the brief: Design and make a desktop-tidy to hold pens, pencils and other small items

Primary School Curriculum (5th and 6th classes)	Junior Certificate (Ordinary level)	Junior Certificate School Programme
Science Strand: Materials Skills development: Working scientifically Designing and making **Visual Arts** Strand: Drawing Strand units: Making drawings Looking and responding **Mathematics** Shape and space Measures	**Project Design and Realisation:** Design briefs/appraisal The process of design Communication of design tools and tooling Joints, fasteners and fixtures Shaping and forming Health and safety	Design solutions Produce and assemble Safety procedures Use of tools Orthography Pictorial drawing

Time scale: The full range of learning and assessment activities presented in this exemplar may take up to eighteen class periods.

Potential areas of difficulty

- Being overwhelmed by the learning process.
- Short attention span and lack of concentration.
- Understanding concepts (difficulties associated with the non-linear nature of the design process).
- Limited vocabulary (understanding technical language).
- Language/writing.
- Spatial awareness (drawing/sketching, organisation of the workspace).
- Transfer to real life—difficulty transferring design intent to practice.
- Calculating (adding, measuring).
- Co-ordination (use of tools, fear of machinery).

Exemplar 3: **Technology Education**

Strategies used in this exemplar

- Using a spiral approach, i.e. introducing the design process at basic level initially and fostering broader and deeper understandings in subsequent projects.
- Using individual student worksheets to differentiate each stage, in booklet form.
- Using an overview/diary worksheet.
- Presenting relevant terminology and allowing space to write/copy simplified meanings.
- Encouraging the use of graphical communication where appropriate.
- Working in pairs/small groups where appropriate.
- Using concrete materials.
- Using templates as appropriate.

Resources

- Pieces of wood/other material pre-prepared to various sizes to enable students to experiment with and express different design possibilities.
- Magazines showing concrete examples of associated models.
- Material and equipment for making the chosen model.
- Design activity sheets.

Exemplar 3: **Technology Education**

Suggested outcomes	Supporting activities	Assessment strategies
As a result of engaging in these activities students should be enabled to • have a basic understanding of the concept of working to a brief • discuss and identify possibilities and constraints associated with the given brief • discuss and suggest some requirements to help satisfy the brief • identify some factors needing investigation • engage in basic research • evaluate ideas/solutions • gain further practice in orthagonal/3-D drawing/ sketching. • progress processing skills.	• **Analysis of a brief:** Students think about and discuss what they are to design. (See *Activity sheet 1*.) • **Investigation and research:** In a class activity students identify and engage in areas that need investigation/research. Small groups engage in specific investigations and report findings. (See *Activity sheet 2*.) • **Design ideas**: Individuals or small groups of students are guided through a process of identifying/proposing design ideas. (See *Activity sheet 3*.) • **Drawing:** Students prepare a working drawing. (See *Activity sheet 4*.) • **Manufacture:** The teacher demonstrates (over a number of sessions) each stage of manufacture to reinforce processing skills and safety considerations. Students engage in each stage using *Activity sheet 5* as a further aid to completing each process safely and in order. • **Evaluation:** Students carry out a brief evaluation of the process and of the finished product. (See *Activity sheet 6*.) • **Diary:** At the end of each session students are helped/encouraged to briefly record what they have achieved/engaged in. • **Differentiation:** Suggestions for differentiation are included with each activity. • **Cross curricular links:** These can be used to reinforce skills if, for example, similar concepts in technology and home economics are treated at the same time.	Each of the activity sheets can also be used as an assessment tool. • The teacher observes students participating in a discussion leading to the recording of a number of requirements and safety issues that apply to the brief. • The teacher observes students listing areas that need further investigation. • The teacher observes students: – engaging in research activities – manipulating sample pieces to express design possibilities – discussing/sketching design ideas – preparing a working drawing – using and setting-out tools/ templates – processing the materials and their assembly – adhering to good safety practice. • Students evaluate the process and the design. • The teacher observes students' ability: – to engage with process – participate in class discussion – give an oral report on a group activity. • The teacher observes the support needed by students to complete tasks, and provides support where necessary.

Exemplar 3: **Technology Education**

Activity 1

Introducing the brief, analysis of the brief

The purpose of this activity is to give students the opportunity to understand the concepts of:

- working to a design brief
- the different stages in a design process
- analysing that brief.

The teacher outlines a problem of keeping pens, pencils, etc. tidy and conveniently to hand on a desk when doing homework, and initiates discussion about what could be designed to respond to that problem.

The teacher introduces a design brief: design and make a desktop-tidy to hold pens, pencils, and other small items.

He/she outlines the different stages of a design process, explaining each term in language appropriate to the student, for example, to analyse is to think about, to investigate is to find out more about, etc.

Students copy the design brief to the relevant activity sheet and write their interpretation of the analysis in the appropriate space.

Analysis

The teacher initiates a discussion/consideration of factors that assist in analysing the brief. Some strategies to facilitate this process would include:

- Underlining/separating key words in the brief to help students identify each element of the problem
- Encouraging students to suggest questions that will help in making decisions about the design, for example, *'What items should it hold?'*, *'What size should it be?'*, *'Should each item have a separate place?'*, *'What must I consider to make it safe when manufacturing it and when it is in use?'*, *'Will I use it myself?'*, *'Where?'*, *'Will I present it to somebody else?'*, *'How will this affect the design?'*.
- Encouraging students to set out pencil cases, pens, pencils, pointer, eraser, etc. neatly on the desk to help them visualise the task. (Different pencil cases will show a variety of possible design solutions.)
- Encouraging students to position and manipulate items to help them understand the task requirements, for example, which items/groups to include, whether pencils should have points facing down.
- Providing pre-prepared material or a finished or bought example of a desk tidy may discourage proper analysis and narrow the focus too much and, therefore, may not be useful.
- Encouraging students to record relevant points in *Activity sheet 1* and to record briefly, activities for that session in their diaries.
- Keeping in mind the spiral approach by limiting the number of considerations to be introduced so that the analysis is not exhaustive.

The brief can be analysed in a whole class situation, where points are explored orally, with the teacher recording contributions on the board or encouraging groups to discuss specific elements of the analysis (requirements, uses, safety issues, etc.). The groups list proposals with one or more students giving reports.

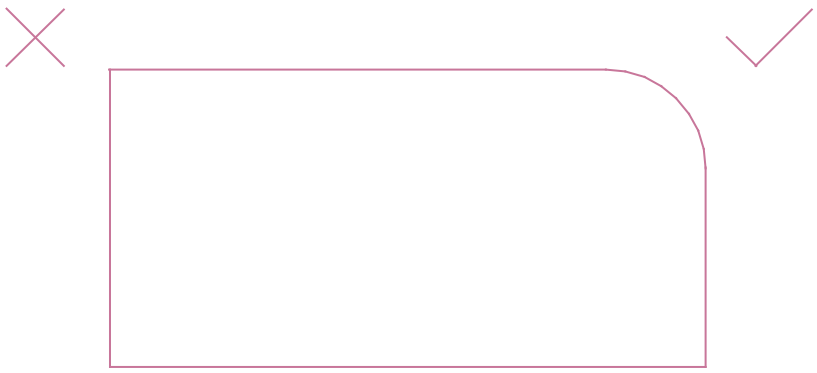
Exemplar 3: **Technology Education**

Differentiation is possible in a number of ways:

- The teacher can accommodate differing outcomes. Some students may be able to write the list of requirements, uses, etc. on the activity sheets without support. Others may complete the activity sheet by referring to lists on the board.
- The *Design Activity sheet* can be varied. Some sheets can have blank spaces (as in *Activity sheet 1*, below) while others can have pre-prepared lists, as follows:

My desk-tidy will hold:	
Pencils	
T-square	
Books	
Eraser	
Pointer	
Paper clips	
Scissors	
?	

- Students can be allowed to draw their intentions rather than write them, for example, showing a rounded corner rather than writing *'My design should have no sharp edges'*, using a diagram such as the following:

The brief


Exemplar 3: **Technology Education**

Activity sheet 1

Analysis

_____

_____

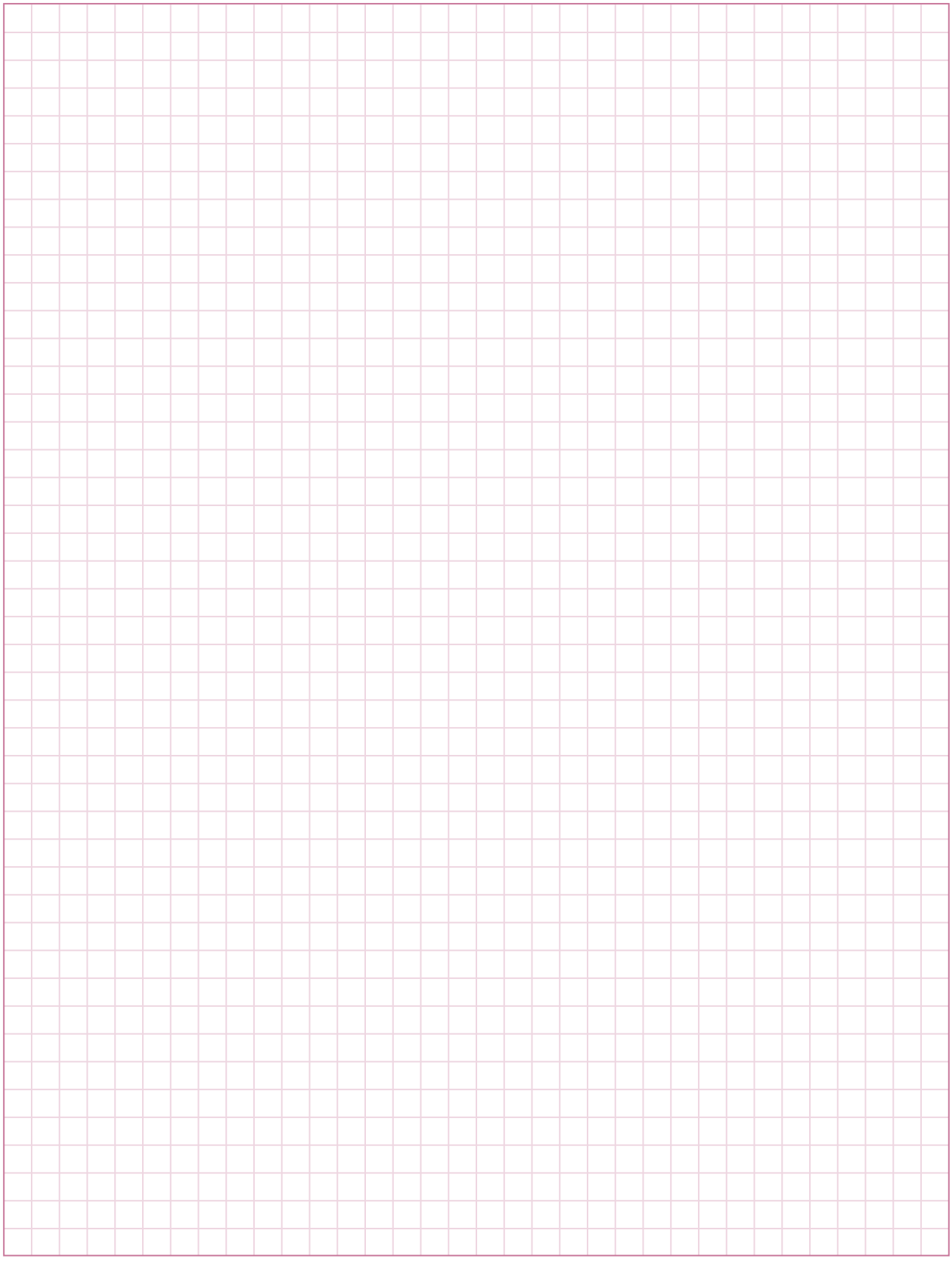
Requirements/use
My desk-tidy should: • _____ • _____ • _____

Constraints
My desk-tidy should not: • _____ • _____ • _____

Safety
My design must: • _____ • _____ • _____

Exemplar 3: **Technology Education**

Use this space to draw.



Exemplar 3: **Technology Education**

Activity sheet (cover)

Diary

Design and make:

Analysis

Investigation/research

Design ideas/solution

Exemplar 3: **Technology Education**

Working drawings

Manufacture

Group activity

Small groups may engage in specific investigation, for example,:

Evaluation

Exemplar 3: **Technology Education**

Activity 2

Research and investigation

The purpose of this activity is to engage pupils in basic research and investigation activities. The analysis is reviewed to help identify areas that need further research and investigation.

Resources, activities, and other considerations will include:

- suitable books, magazines brochures, etc. supplied in the class
- school library/internet facilities as appropriate
- books, magazines, store visits, or an interview as a homework activity
- pasting cut-out examples and recording relevant results in *Activity sheet 2*
- suitable size of holes/drill bits required to accommodate a pen/pencil
- thickness of the material/depth of hole required to hold a pen/pencil securely
- safe distance in from the edge of the material for holes or mortise
- suitability of materials/finishes/processes and reporting their findings
- keeping a diary to record each activity briefly in the relevant section. (Recording in the diary is important throughout the process as activities may overlap. Students may need to revisit investigation again during other stages of the design process.)

Differentiation can be accommodated by:

- allowing for differing outcomes (in a group activity students may participate according to their respective abilities, for example, not all of them may be able to lead)
- allowing students to communicate graphically by illustrating the results of an investigation in the space provided in *Activity sheet 2*.

Exemplar 3: **Technology Education**

Activity 2 (continued)

Research and investigation

Paste some ideas from magazines/books in this space.

Exemplar 3: **Technology Education**

Record information here.

Material
• _____
• _____
Sizes
• _____
• _____
Capacity
• _____
• _____
Finish
• _____
• _____

Exemplar 3: **Technology Education**

Activity 3

Design ideas/solution

The purpose of this activity is to engage pupils in proposing and developing design ideas.

Material

At least three different sets of pre-prepared material, each set having different shapes/sized material, would be required to facilitate group activity.

In a class activity the teacher initiates discussion to investigate some of the design possibilities pertaining to each of the three pre-prepared material sets.

Small groups, each with a sample of each of the pre-prepared material sets, are facilitated in engaging in creative discussion/activity to propose design solutions for each.

Students are encouraged to sketch different design ideas in *Activity sheet 3*.

Differentiation can be accommodated by:

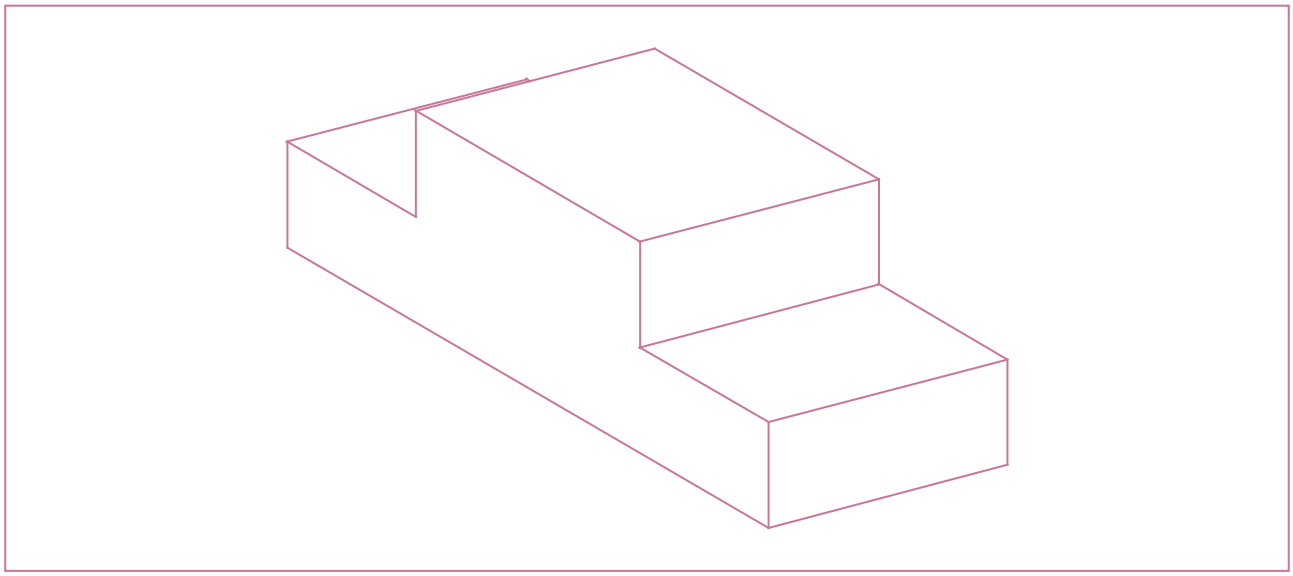
- varying the content of the activity sheet, for example, providing blank spaces to allow students to sketch a full design idea or by providing an outline sketch of each material set
- allowing students to draw their ideas on the material set, to facilitate spatial perception prior to completing the activity sheet
- encouraging students to evaluate each design idea briefly and list some reasons for choosing one design
- encouraging students to record the activity in a diary.

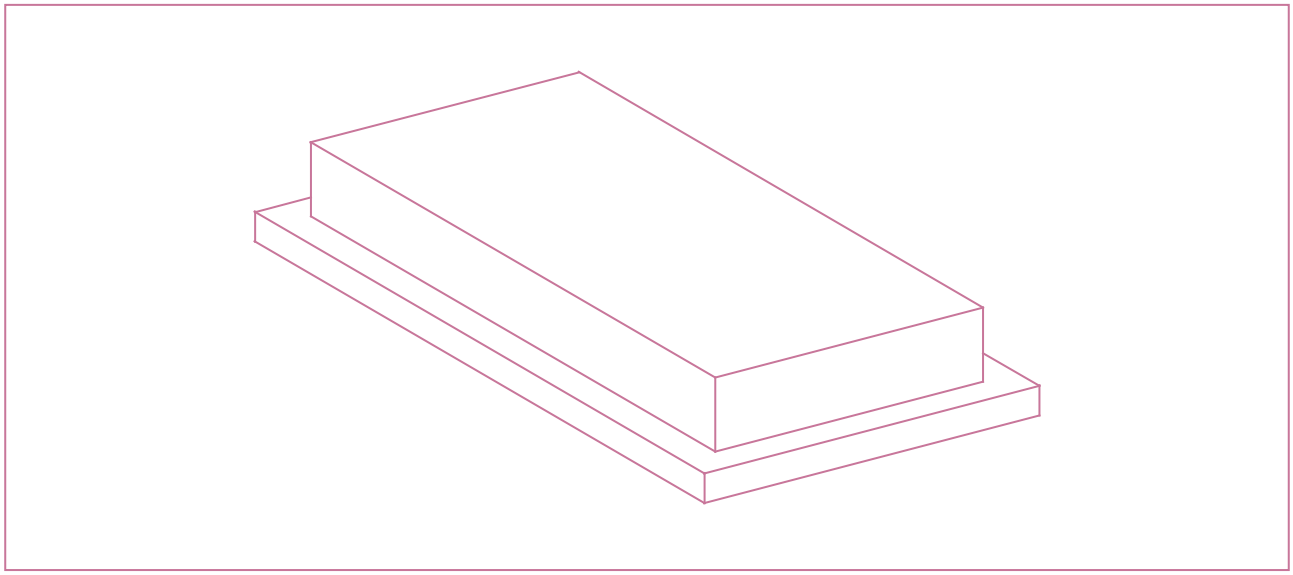
Exemplar 3: **Technology Education**

Activity sheet 3

Design ideas/solution

Use each space to show your ideas.





I will choose the _____ idea because:

- _____
- _____

Now finish this idea completely to help you make a working drawing.

Exemplar 3: **Technology Education**

Activity 4

Working drawings

Students complete a working drawing of their design.

Differentiation can be accommodated by:

- varying the content of the activity sheet, for example, providing a blank activity sheet to allow students to complete a full working drawing independently or by including an outline of elevation, plan, and a 3-dimensional view allowing students to add their design elements
- providing templates for some students at the marking out stage to aid them in completing the plan view of the working drawing
- encouraging students to record the activity in a diary.

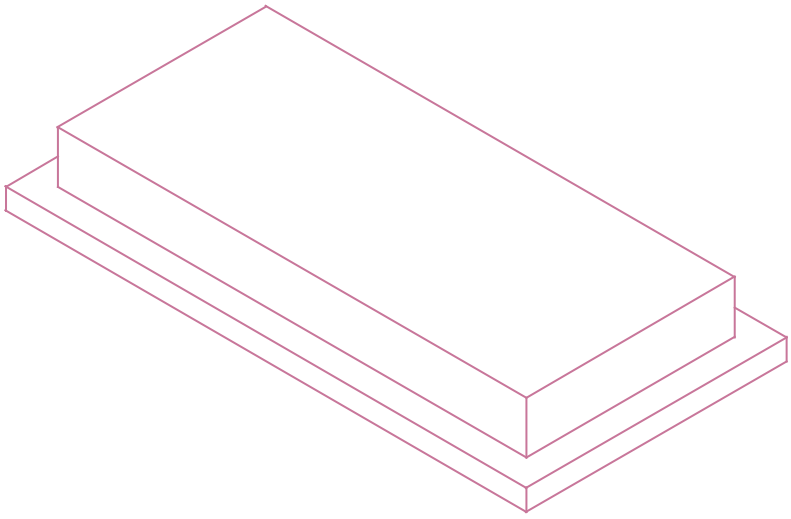
Exemplar 3: **Technology Education**

Activity sheet 4

Working drawings

Elevation

Plan



Isometric view 1:2

Cutting list
Base _____
Top _____

Exemplar 3: **Technology Education**

Activity 5

Manufacture

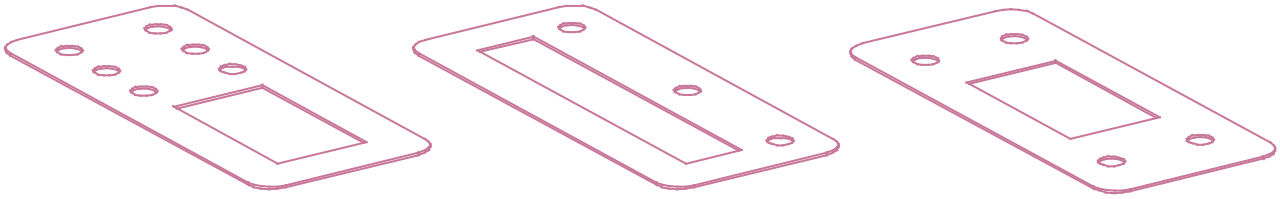
The teacher demonstrates each process as appropriate and emphasises relevant safety considerations.

Students use *Activity sheet 5* as an aid to completing each process.

The three basic processes, drilling, mortising and rounding can be completed in any order. Divide the class into groups to utilise machines as appropriate.

Differentiation

- Use templates to aid setting-out.



- Some students may achieve setting-out using tools. Others may need to be assisted by use of templates as illustrated above.
- Although this is a closed brief with regard to material sizes and processes involved, each student should be encouraged to complete an individual solution when considering the number and positioning of holes, mortise(s), etc.
- Students working in pairs/small groups may, in certain circumstances, assist other students who may need help in using a particular machine.

Note

Setting slow drill speeds and using 6mm mortise chisel may be advisable.

Using spray finish may aid consistency.

Students should record each activity in a diary.

Safety
■ **Students should study the safety notice near each machine before using it.** ■ **Students should get permission from the teacher before switching on any machine.**

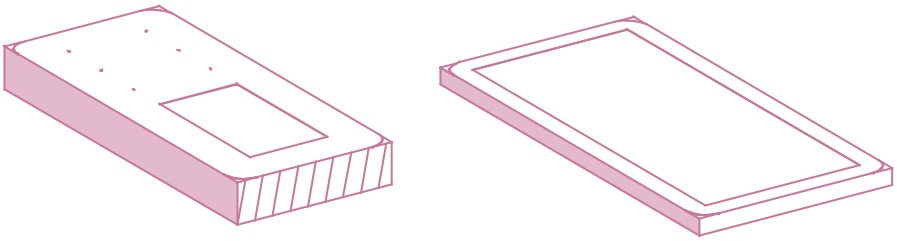
Exemplar 3: **Technology Education**

Activity sheet 5

Manufacture

Use this sheet to help you mark out and make your desk-tidy.

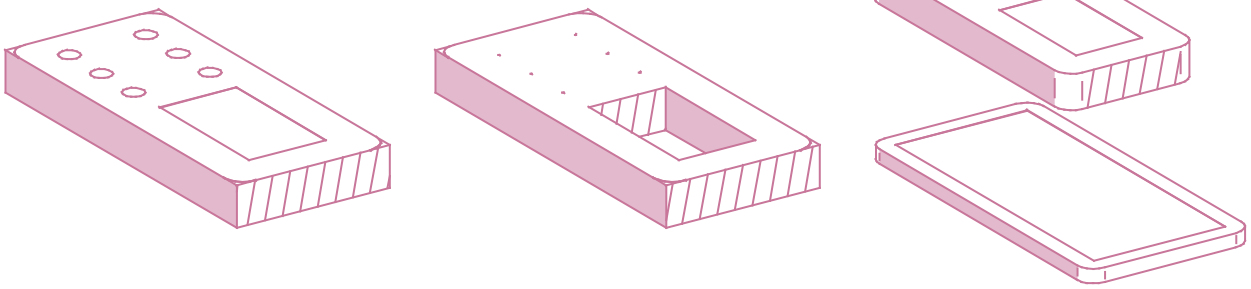
Mark out



Mark the positions of holes, mortise and rounds.

Tools: tri-square, ruler, marking gauge, compass, template.

Make (in any order)

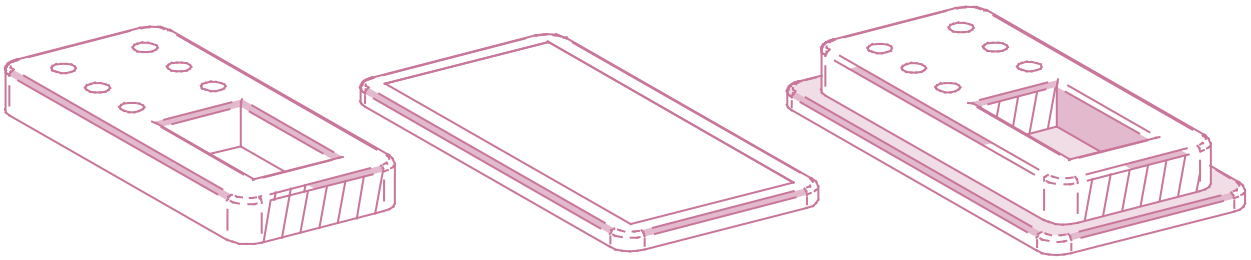


Drill holes. Take out mortise. Shape rounds.

Tools: pillar drill, mortise machine, sander, sand paper.

Exemplar 3: **Technology Education**

Clean up and assemble



Sandpaper all sharp corners.

Glue and clamp.

Tools: pillar drill, mortise machine, sander, sand paper.

Safety

- **Students should study the safety notice near each machine before using it.**
- **Students should get permission from the teacher before switching on any machine.**

Exemplar 3: **Technology Education**

Activity 6

Evaluation

The purpose of this activity is to allow students review the design process and to engage in evaluating elements of the process and of the finished article.

Class discussion on each element of the design process reinforces each stage of that process, for example, '*Why did we analyse the task?'*, *'How did this help us?'*, *'Why was it important to research?'*.

Discussion on the manufacture stage encourages students to identify difficulties and suggest reasons.

Examining the finished article encourages students to evaluate and suggest improvements.

Differentiation can be accommodated by:

- allowing for different outcomes, for example, some students may complete the evaluation sheet independently while others may choose items from a list on the board arising from class discussion.
- varying the design of the activity sheet, for example, *Activity sheet 6* allows for written evaluation but substituting tick-charts for some or all sections may be appropriate also, as in the following:

	Excellent	Very good	Good	Fair
Design				
Fitness for purpose				
Appearance				
Safety				
Finish				

Note

A photograph of the finished product supplied to the student in class may be included as part of the evaluation and may add relevance to the design portfolio as it shows the complete process including finished article.

Students record in diary.

Exemplar 3: **Technology Education**

Activity sheet 6

Evaluation

Design
Good points
Bad points

Manufacture
Areas well done
Difficulties

Exemplar 3: **Technology Education**

Paste photograph here:

Overall opinion of finished article
Changes I would make

Exemplar 4: **Technology Education**

Syllabus topic: Metalwork: Techniques and design

Statement of the brief: Design and make a key tag

Primary School Curriculum (5th and 6th classes)	Junior Certificate (Ordinary level)	Junior Certificate School Programme
Working scientifically: Designing and making: Estimating and measuring	**Techniques and design:** ■ Health and safety ■ Benchwork ■ Drilling ■ Design	**Materials and technology:** ■ Materials technology ■ Tools technology ■ Production of a piece of work ■ Apply the basic knowledge and skills necessary to produce artefacts using engineering materials

Time scale: The full range of learning and assessment activities presented in this exemplar may take five class periods. This would include a single class for a general introduction to safety and familiarisation with the practical environment.

Potential areas of difficulty

- → Lack of awareness of the necessity for safety.
- → Feeling overwhelmed by the practical environment.
- → Lack of dexterity, and poor grip and control of tools and equipment.
- → Limited previous knowledge of the subject area.

Strategies used in this exemplar

- Starting with simple everyday objects that help to build up skills of marking out, cutting, drilling and shaping.
- Designing projects so that all students can achieve at their own pace.
- Practicing each new process so that each student is confident within a safe working environment.

Resources

- Safety notices should be displayed giving information about how to behave and control all machines and equipment.
- Examples of possible projects done by other students should be displayed so that students can examine them.
- The raw materials used to make a number of projects should be placed with finished models so that students get a sense of what the subjects is about.
- Basic hand and machine tools for marking out, cutting, drilling, shaping and finishing should be available to each student.
- Templates to assist in marking out should be available for students who may find it difficult to comprehend a drawing or have dexterity limitations. The sequence involved in the marking out and manufacture of each project should be on a chart/cards.

Exemplar 4: **Technology Education**

Suggested outcomes	Supporting activities	Assessment strategies
As a result of engaging in these activities students should be enabled to • understand the need for safely in a workshop environment • identify common materials used in everyday situations • identify common tools and equipment • discuss the function of a key tag and choose from a selection of designs • use templates to mark out the basic shape of a key tag • use a drilling machine and hand tools to drill, cut, form, finish, and engrave their chosen shape • test and evaluate the finished product and list safety precautions that were observed.	• Demonstration of machine and hand tools in action and the need to wear safety equipment. • Looking at the immediate environment (school, car park, classroom, home, transport, play area). • Becoming familiar with tools (ruler, tri-square, scriber, saws, files, and drills). • Allowing students to explore a number of different shapes, such as squares, rectangles, circles and ellipses taken from common objects, money, logos, etc. • The teacher using blank templates in flat plastic or metal to demonstrate the marking out of a selection of shapes, followed by students marking out their own chosen shapes. • The teacher giving a demonstration of all new processes, including using tools and machines with an emphasis on safety. • Attaching the key tag to a ring and reflecting on the various stages and processes in its safe manufacture.	Assessment techniques and strategies should relate to the students' own particular peer group. The teacher observes students': • interaction with other students and the teacher • level of participation and understanding • ability to discuss and explain why they chose a particular design • dexterity in using tools and equipment safely • ability to present an evaluation of their finished key tag.

Exemplar 4: **Technology Education**

Activity 1

Safety

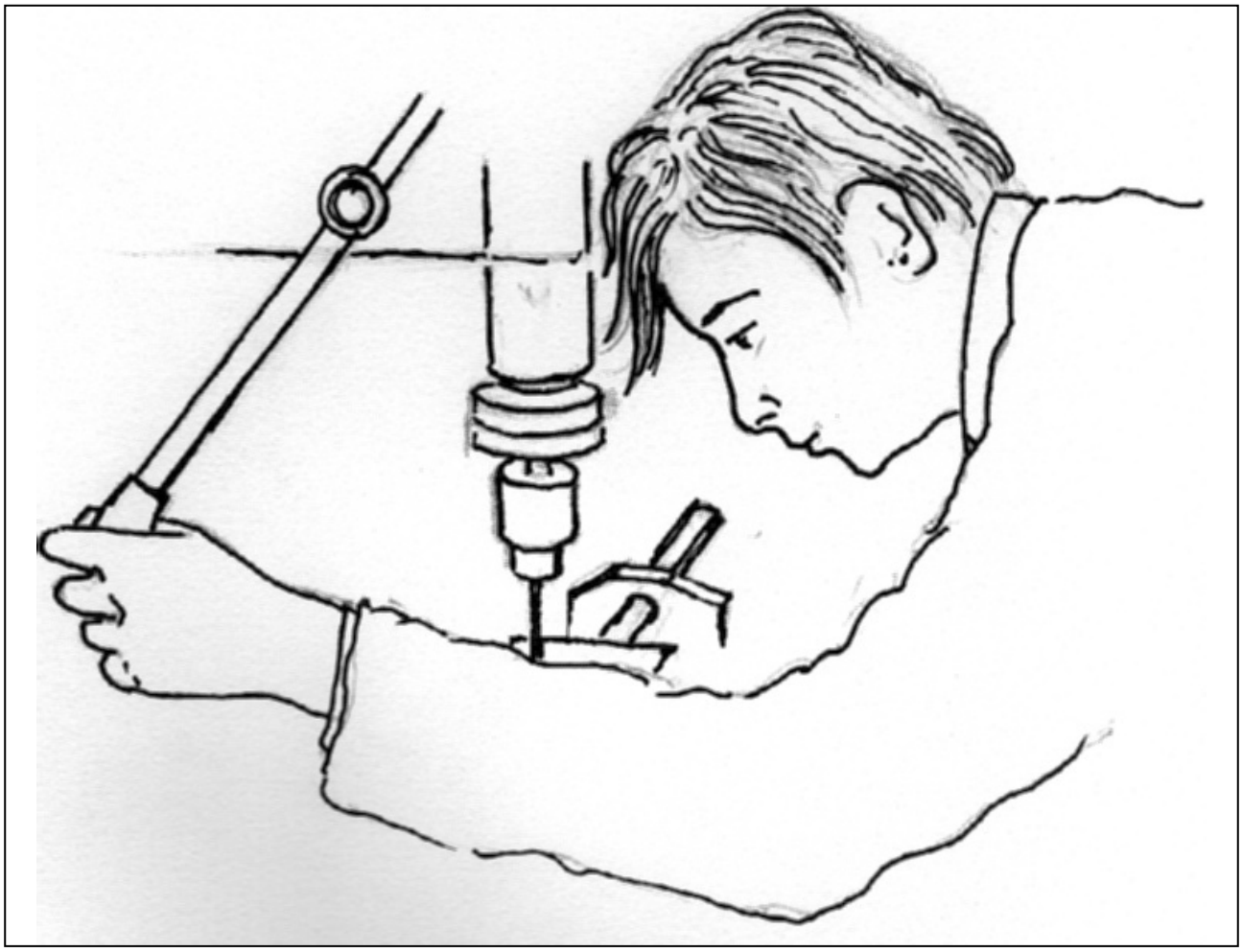
Workshop environment safety

The purpose of this activity is to introduce students to a workshop environment. It is likely that this will be totally new and may be an overwhelming experience for them.

It presents many opportunities to access areas of education that they might never experience otherwise.

Students have a natural curiosity and like to explore new situations. This curiosity should be nurtured, so it is necessary to ensure that the wonder and awe is not dampened by long lists of do's and don'ts. Safety is central to all activities and it may be necessary for the teacher to have assistants to help when the nature of students' learning disabilities or class sizes demand it.

Why wear glasses?



Tie back the hair?

Exemplar 4: **Technology Education**

Personal safety

Students love to be involved and it is vital that the teacher demonstrates safety procedures and that students practice each routine. It should be made clear to every student that:

- no running is allowed in the workshop
- no loose clothing should be worn
- all pathways should be kept clear.

The basic safety procedures showing fire extinguishers and emergency exits should also be shown to everybody.

It is important to show how hand tools are handled, used, and stored safely. It should be made clear to students that they may only use a machine when they have been show how to use it, and can themselves demonstrate how to control it safely. When using power tools such as drilling machines all students should be able to turn power on and off and safety goggles should be worn. Safety procedures involving techniques for holding and clamping should be emphasised.

Care should be taken when designing projects to insure they can be made safely.

Safety when drilling		**Safety at bench work**	
I can use a drilling machine		I can use marking out tools	
I can switch it on		I can clamp material in a vice	
I can switch it off		I can open a vice	
I can clamp work		I can use a hacksaw	
I can drill a hole		I can hold and use a file	
I know the way		I can identify plastic	
Do I need help?		I can identify metal	

Exemplar 4: **Technology Education**

Activity 2

Materials

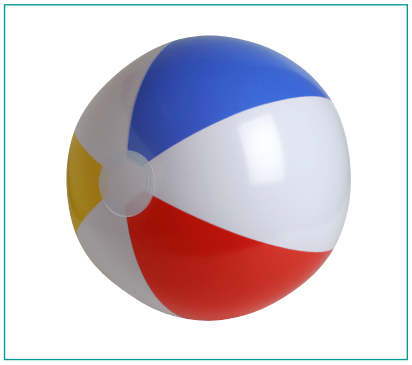
Name or draw examples of materials made of metal, plastic, wood, and stone at home or in school. You can use the pictures on page 66 for some ideas.

Metal	**Plastic**
Wood	**Stone**

Exemplar 4: **Technology Education**

Activity 2

Materials



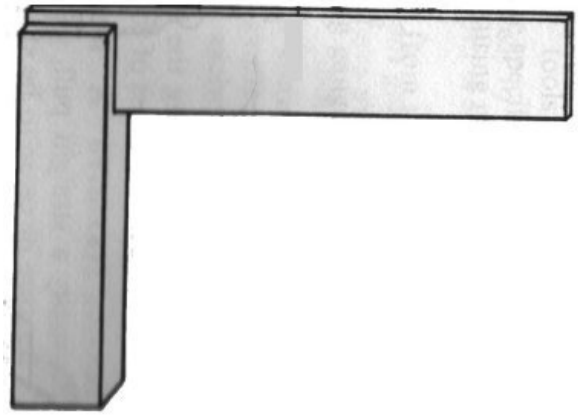
Exemplar 4: **Technology Education**

Activity 3

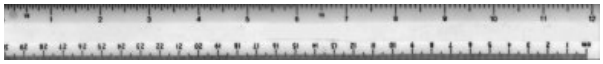
Hand tools

Identify common marking out tools, such as a ruler, a tri-square and a scriber, and shaping tools such as saws, files and drills.

Tri-square

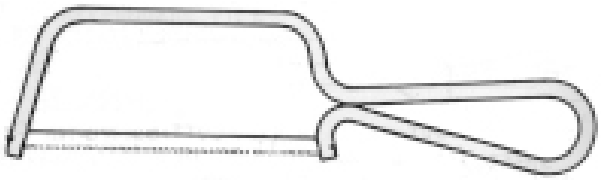


Steel ruler



Drill bit

Junior Hacksaw



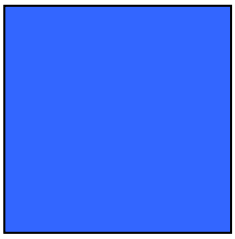
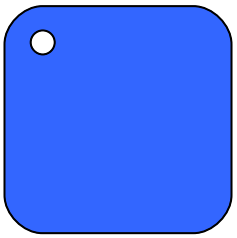
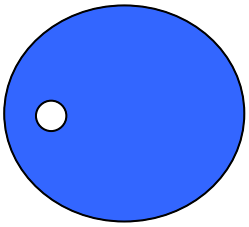
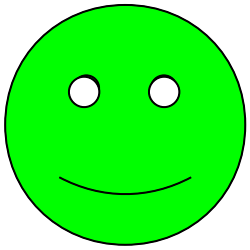
Exemplar 4: **Technology Education**

Activity 4

Making a key tag

A selection of designs

A selection of key tags should be available including blank material. Use a variety of coloured plastics. Discuss the function and properties of a key tag.

Blank material	Drill a hole and round the corners	Alternative designs
		
		
Finished key tag		
		

Choose from a selection of basic designs, including a square, a rectangle, a circle, and an ellipse. Combinations of the shapes should be encouraged. The position of a hole to attach it to the key ring should be discussed.

Students should be encouraged to design their own unique shapes keeping in mind the ease of manufacture. Acute angles or very small circles should be avoided.

Exemplar 4: **Technology Education**

A cylinder is used to mark the curved shape on the corners. The plastic has a paper surface for marking on with a biro.

Use templates to mark out basic shape of the key tag.
The use of templates allows students to mark out shapes without an understanding of geometry. Later projects should introduce marking out in which students can use a tri-square and measuring tools.

Finishing
All edges should be draw-filed and sanded to a smooth finish. Student's names should be engraved on the finished projects. Each tag should be fitted to the student's keys.

Grip the project securely while drilling, and wear safety glasses.

Hold the project securely in a vice and use a file to round the corners.

Exemplar 5: **Technology Education**

Syllabus topic: Metalwork: Techniques and design	Make a seesaw

Primary School Curriculum (5th and 6th classes)	Junior Certificate (Ordinary level)	Junior Certificate School Programme
Science **Skills development:** Working scientifically Designing and making: Making	Techniques and design Health and safety Benchwork Drilling Hot and cold forming of materials Fitting and assembly Decorative finishing of materials Lathework Design	**Theory:** Demonstrate the knowledge of engineering materials, equipment, processes and workshop safety **Production of a piece of work:** Apply the basic knowledge and skills necessary to produce artefacts using engineering materials

Time scale: The full range of learning and assessment activities presented in this exemplar may take twenty class periods. This would include a single class for a general introduction to assembly and the reinforcement of safety awareness.

Potential areas of difficulty

- Lack of awareness of the necessity for safety and being overwhelmed by the practical environment.
- Lack of dexterity, and poor grip and control of tools and equipment.
- Limited previous knowledge of the subject area.
- Lack of confidence.

Strategies used in this exemplar

- Looking and examining students' own projects made to date. (These projects gave students a foundation in the skills of marking out, cutting, drilling, and shaping.)
- Designing projects so that all students can achieve at their own pace.
- Practicing each new process so that each student is confident within a safe working environment.
- Ensuring that the manufacture of individual component parts of this project is within the capacity of all students.
- Drawing student's attention to individual parts so that they will see that these are within their capacity to manufacture.

Exemplar 5: **Technology Education**

Resources

- Safety notices should be displayed giving information about how to behave and operate all machines and equipment.
- Examples of similar projects done by other students should be displayed so that students can examine them.
- The raw materials used to make a number of projects should be placed alongside finished models so that students gain an understanding of materials.
- Basic hand and machine tools for marking out, cutting, drilling, shaping, and finishing should be available to each student.
- Templates to assist in marking out should be available for students who may find it difficult to comprehend a drawing or who may have dexterity limitations.
- The sequence involved in marking out and manufacture for each project should be displayed on a chart or cards.
- This project is suitable for students who have some experience and it is presumed that they have been introduced to the workshop environment and have already made a number of projects. While this appears more challenging than the previous exemplar it is really an extension. Each part is not very complex and assembly produces a satisfying outcome. Careful management of processes and the use of templates for marking out will help students who find some of the marking out tools and geometry construction challenging.
- Students can be encouraged to impose their own design on different parts, such as the board or base. Some may also attach teddy bears or make their own figurines for each end.

Exemplar 5: **Technology Education**

Suggested outcomes	Supporting activities	Assessment strategies
As a result of engaging in these activities students should be enabled to • understand and interpret component parts from drawings • use instruments, tools and templates to mark out the shapes • list the tools and equipment necessary to make each part • list a work sequence for marking out each part • list safety precautions that should be observed during the manufacture of each part • use hand tools to drill, cut, form, and finish all parts, and introduce screw cutting equipment • use a lathe or drilling machine to drill a hole through the spindle • use a strip heater to shape each support bracket • assemble all parts, and test and evaluate finished product.	• Finished components can be examined, and parts named and measured with a rule and compared with the given dimensions. • The teacher demonstrates, then students mark out all shapes using instruments with the assistance of pre-made templates if necessary. • Sequence the work on cards if students require this. • Previous experience will help students to list the tools. Student and teacher discussion and questioning will assist in clarifying this activity. • Using the blank raw materials discuss the sequence for making each part, eliciting reasons for the order of work. • The teacher demonstrates all new processes, including the use of tools and machines, with an emphasis on safety. • The teacher demonstrates the safe use of machine and hand tools and introduces screw cutting. Teacher assistance may be needed with technique, and a threaded bar can be used • Safe practice in the work of holding and drilling should be observed when working on the lathe. The student should be encouraged to refer to the checklist provided by the teacher. • The teacher demonstrates the safe use of the strip heater showing how each angle is produced. • Using the screws supplied all parts are carefully assembled and tested for functionality.	• The teacher observes whether students can: – identify component parts – measure and check off given dimensions, working in pairs – mark out – point to and name tools – uses machine and hand tools safely – bend support brackets using a strip heater • Students assess their own finished marking against a template provided by the teacher. • Students list the 6 stages of the project in order. The teacher can have these printed and illustrated on cards. Students (in pairs, perhaps) can arrange the cards in the correct order. Alternatively the teacher can write them in jumbled sequence on the board and ask students to rearrange them correctly. • In pairs students talk through the list and fill in omissions as they occur. • Students self assess the assembly and function of the project.

Exemplar 5: **Technology Education**

Making a seesaw

This process makes a functional project from the individual component parts. Examples of partially and fully assembled projects will help students to see how the parts go together. Students will have a good knowledge of each component and its drawing will make more sense as they progress through marking out and making the parts themselves.

Activity 1

Understanding drawings and naming the parts

Naming the parts

Students should be encouraged to examine the working drawings and previously made examples of the seesaw.

On a close examination of the drawings most students will identify the board. Names such as supports, base and spindle are not likely to be known by the students, but most will be able to describe how the seesaw works and give a description of the purpose of each part. This strategy will draw out most of the component names.

Component parts

1. Supports (two required).
2. Base.
3. Board.
4. Spindle.
5. Axle.
6. Screws (four required).
7. Hexagonal nuts (two required).
8 Adhesive.

Measuring

When students are introduced to drawings of new projects for the first time, finished component parts should be measured with a rule and compared with the given dimensions on the drawing. This gives students an understanding of how to apply measurements when marking out blank materials.

Exemplar 5: **Technology Education**

Activity 2

Marking out the shapes

Clear and concise demonstrations on marking out should be given. Initially, the number of steps should be kept short and a list or sequence should be made available on cards for students who may require it. All students should be encouraged to mark out the shapes on blank materials using instruments. The use of pre-made templates will assist students who experience difficulty, and will also act as a reference for students who mark out using instruments.

Tools for marking out

1. Rule.
2. Tri-square.
3. Protractor or setsquare.
4. Pencil and scriber.

Previous experience of making projects will help students to list the marking out procedure.

Procedure

1. Check that the blank material is large enough to make the part.
2. File two adjacent reference edges and identify each.
3. Mark and draw all horizontal and vertical lines as per measurements.
4. Mark and draw angles and curves as required.
5. Check that lines are correct against the templates provided by the teacher.

Activity 3

Making the parts

Tools, machines and equipment

1. Drilling machine.
2. Drill bits.
3. Lathe.
4. Strip Heater.
5. Hacksaw.
6. Files.
7. Screw cutting equipment.
8. Screwdriver and spanner.

Students identify the main tools, machines and equipment required to make the parts.

Exemplar 5: **Technology Education**

Activity 4

Making

The teacher should give demonstrations of each process and revise previously taught processes frequently. Safety and the correct holding of tools and equipment needs constant reinforcement. Short concise demonstrations are effective as concentration levels may be limited with some students. It should be understood that pupils prefer doing rather than listening or observing the teacher doing. It is presumed that students will have previous experience with most of the processes involved.

Previous experience of making projects will help students to list the equipment and work sequence required.

Work sequence

1. Drill all holes when required.
2. Use lathe or drilling machine to drill the spindle.
3. Cut waste material using a hacksaw.
4. File accurately to the marked lines.
5. Bend using a strip heater.
6. Polish all edges.

Activity 5

Safety

New processes such as using a lathe will require extra vigilance, particularly in the case of a student who might have a delayed response to a potential hazard. It will sometimes be necessary for the teacher to assist with the controls, but the student should be encouraged to participate fully. Safety goggles should be worn and work must be secured when machining. Safety considerations with the use of a strip heater should to be reinforced during a demonstration of its use.

Safety checklist and revision

Safety when using a lathe		Safety when using the strip heater	
I can use a lathe		I can switch it on	
I can switch it on		I can switch it off	
I can switch it off		It can burn me	
I can clamp work securely		I can measure an angle	
I can drill a hole		I need help	
I need help			

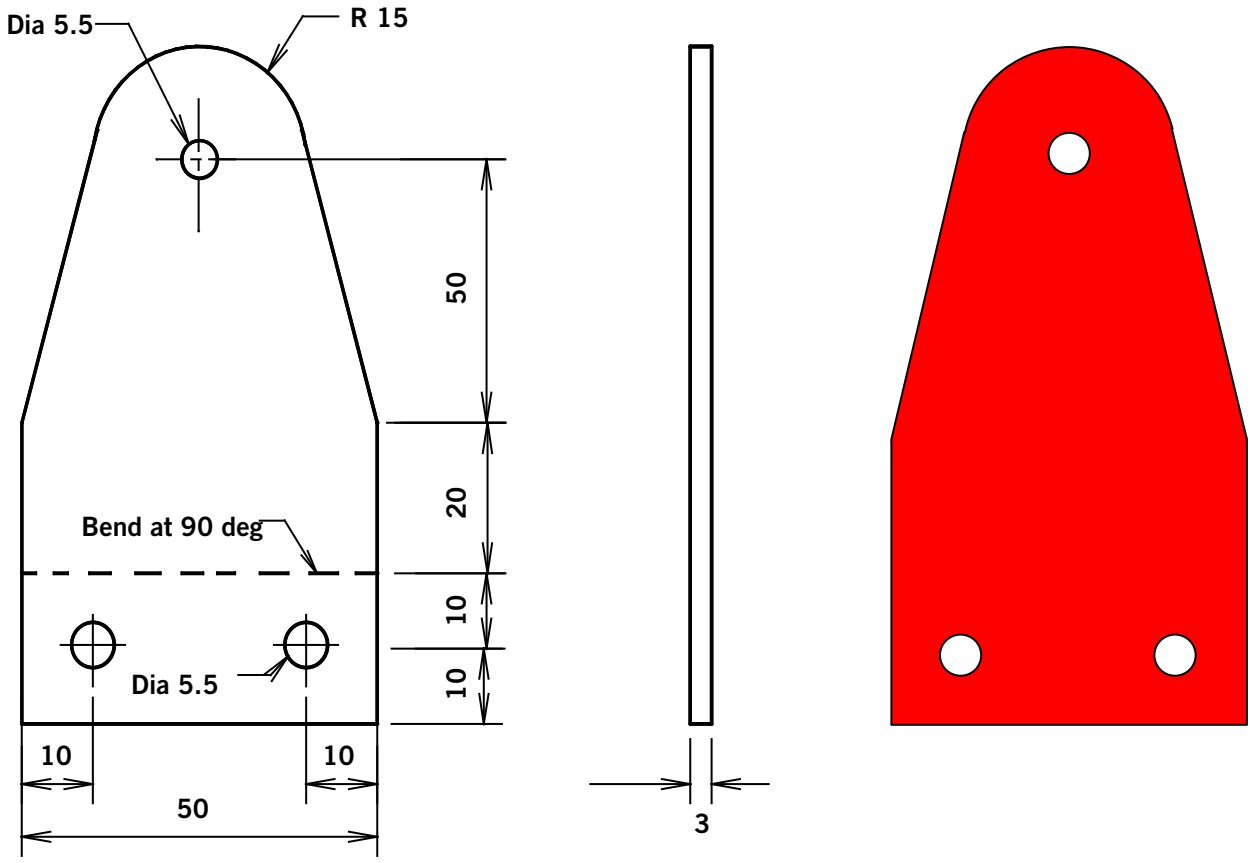
Exemplar 5: **Technology Education**

Activity 6

Assembly and testing

1. Check the assembly drawing.
2. Check previously assembled projects.
3. Assemble the supports to the base using the four screws supplied.
4. Attach the spindle and insert the axle, securing it with two hexagonal nuts.
5. Mark the centre of the board and attach the spindle using an adhesive.
6. Test, evaluate and grade the finished project against the original drawings.

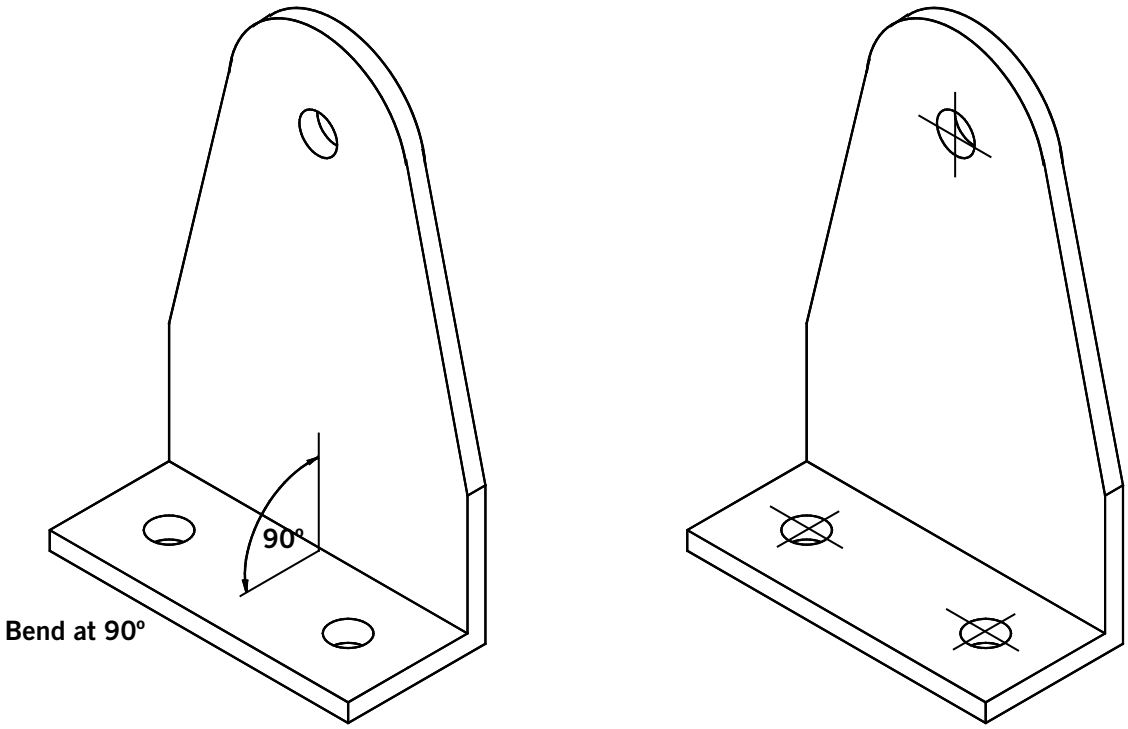
Supports



Front elevation **End elevation**

Exemplar 5: **Technology Education**

Template of the support

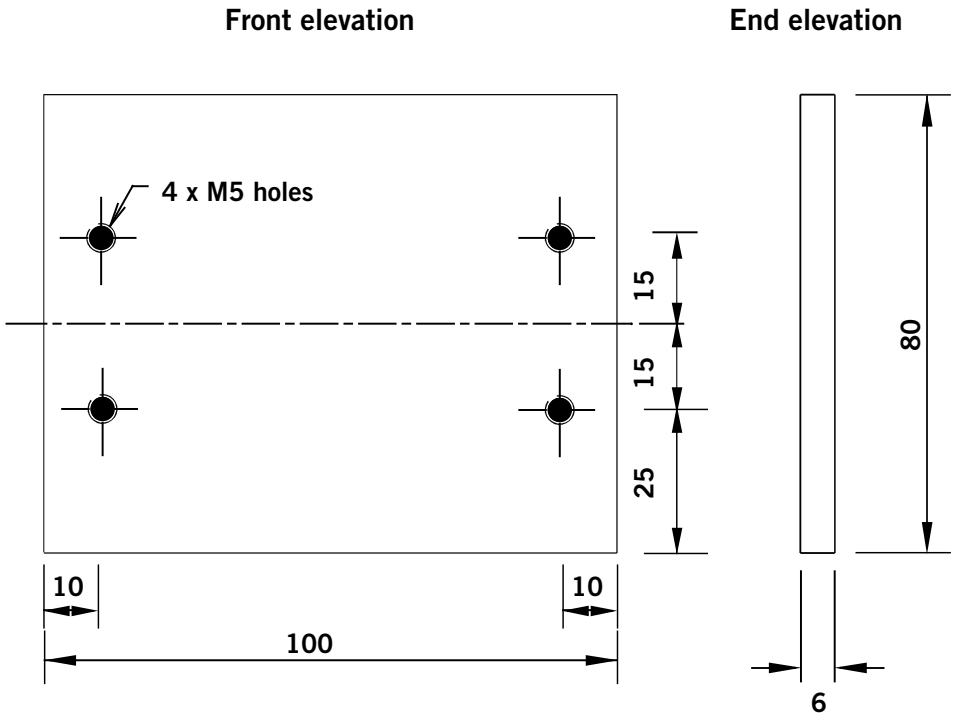


1. Use a variety of colours.
2. Mark out the shape using tri-square, rule, and pencil or biro.
3. The template can be used to check for accurate marking out. It can also be used to help students who may experience difficulty using instruments.
4. Take care to protect the surface of the plastic when holding it in a vice.
5. Cut the waste using a hacksaw.
6. File all edges accurately to the lines and draw-file edges.
7. Heat along the dotted line using a hot wire bending machine and bend at 90°.

Supports: **2 required**
Material: **105 x 50 x 3 acrylic (perspex)**

Exemplar 5: **Technology Education**

Base



1 Use a variety of colours.

2 Mark out the shape of the base using tri-square, rule and biro.

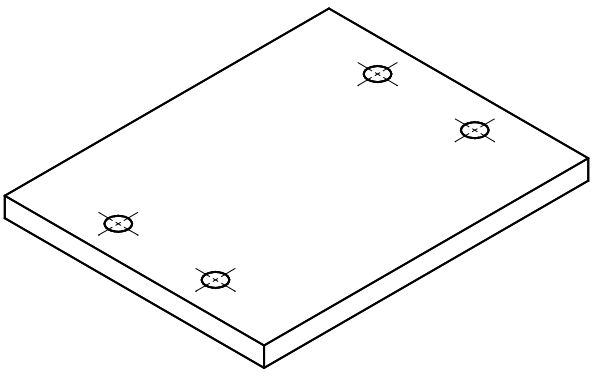
3 A template can be used to check for accurate marking out. It can also be used to help students who may experience difficulty using instruments.

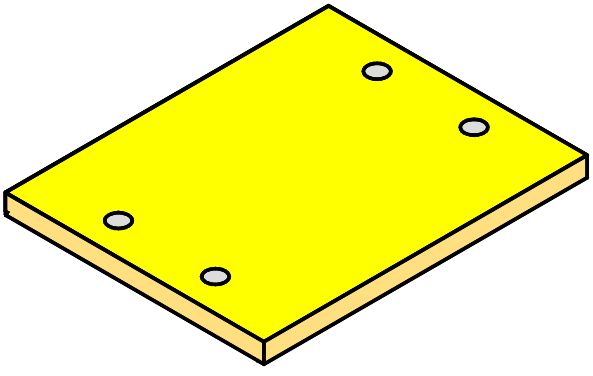
4 Drill the four holes diameter 4.2.

5 Using an M5 tap thread each of the four holes.

6 Draw-file all edges.

Base: **1 required**
Material: **100 x 80 x 6 acrylic (perspex)**

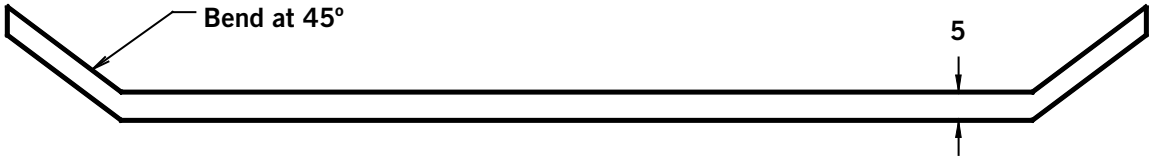




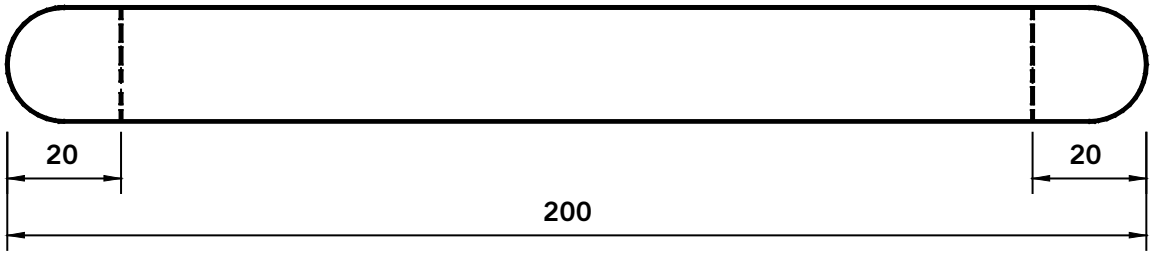
Exemplar 5: **Technology Education**

Board

Front elevation



Plan



1 Use a variety of colours.

2 Students should be encouraged to design their own board.

3 Mark out the shape of the board.

4 The ends should be curved.

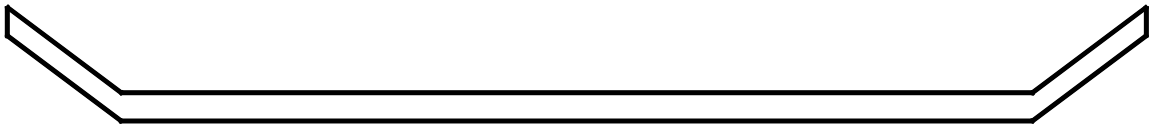
5 Heat along the dotted lines using a hot wire bending machine and bend at 45°.

6 Draw-file all edges.

7 Design and make any two appropriate figures to balance on each end of the board.

Board: **1 required**
Material: **200 x 20 x 5 acrylic (perspex) any colour**

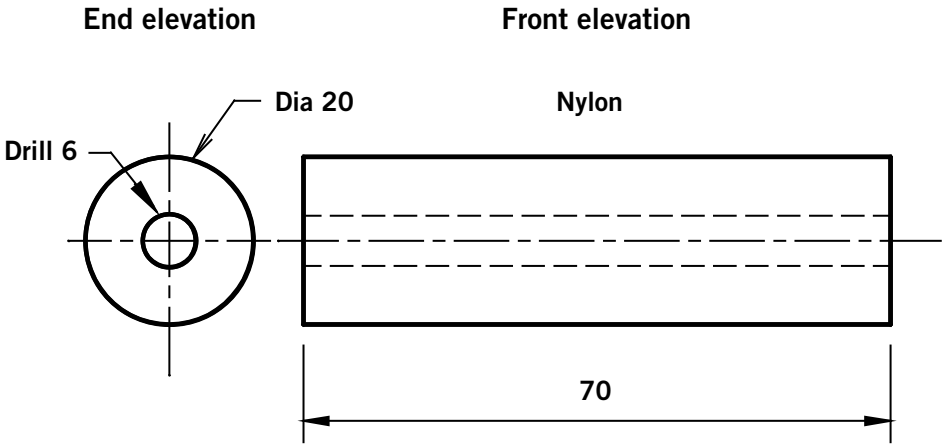
Front elevation



Plan

Exemplar 5: **Technology Education**

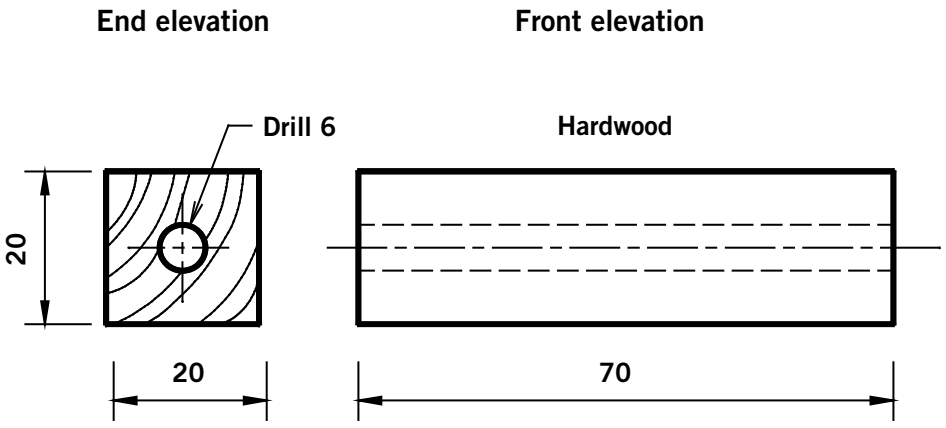
Spindle



End elevation

1. Use either diameter 20 nylon or 20 x 20 hardwood.
2. Use the lathe to face both ends and to drill diameter 6 hole through the centre.
3. If using the hardwood drill diameter 6 on the drilling machine.

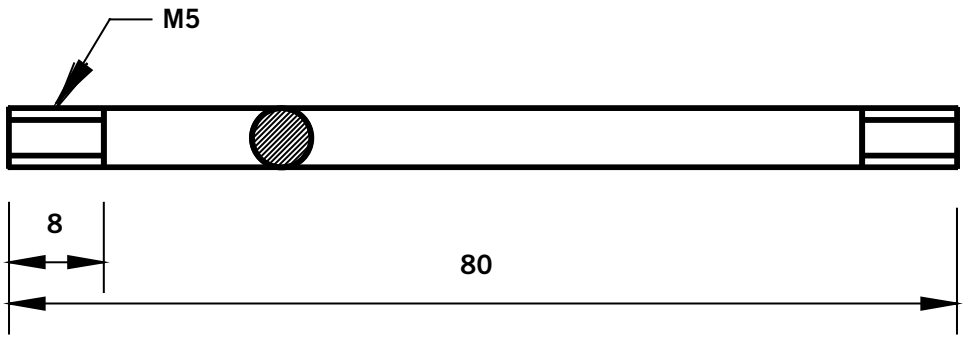
Spindle: **1 required**
Material: **Diameter 20 x 70 nylon**
Or: **20 x 20 x 70 long hardwood**



Exemplar 5: **Technology Education**

Axle

Front elevation



1. Mark out the length of the threaded area at each end.
2. Using an M5 stock and die thread at each end as shown.
3. As an alternative students can use M5 threaded bar. This will not require the use of M5 dies to thread each end.

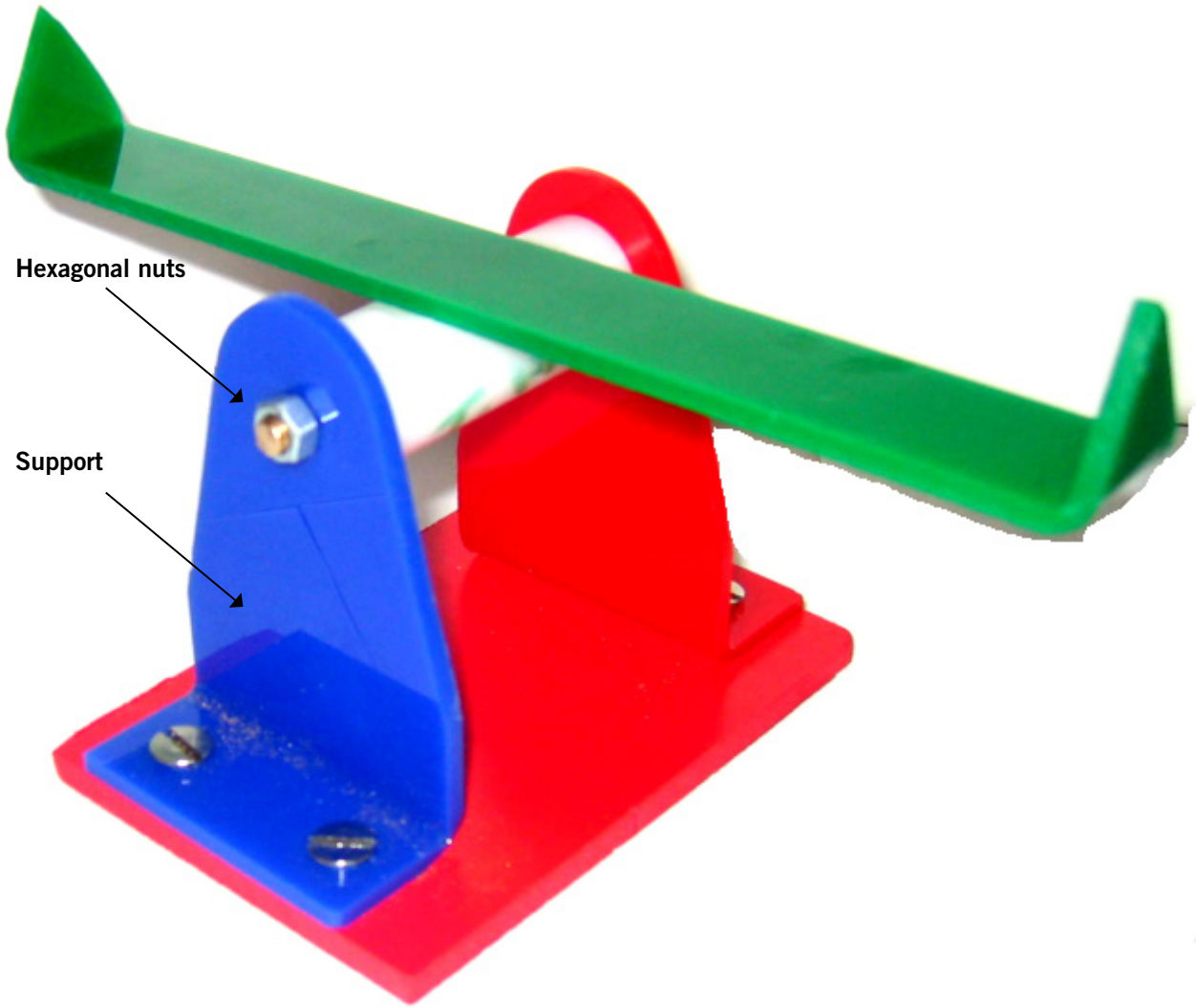
Axle:	**1 required**
Material:	**Diameter 5 mild steel**
Or:	**M5 threaded bar**
Nuts	**M5 hexagonal nuts**

Exemplar 5: **Technology Education**

Assembly of finished seesaw

1. All edges of plastic should be draw-filed and polished to enhance its appearance.
2 Using M5 screws assemble the supports to the base and tighten with a screwdriver.
3 Using an adhesive attach the board to the spindle or the hardwood.
4 Insert the axle and secure with an M5 hexagonal nut at both ends.
5 As an added feature students should be encouraged to design two different figures and attach them at each end of the board.

Use a variety of colours.



Exemplar 6: **Technology Education**

Syllabus topic: Technical graphics: Descriptive geometry

Aspect: Graphical design: Patterns

Primary School Curriculum (5th and 6th classes)	Junior Certificate (Ordinary level)	Junior Certificate School Programme
Science **Skills Development:** Working Scientifically Designing and making:	**Descriptive Geometry:** Communication graphics: Graphics in designing Graphical design and representation Computer graphics	Use basic drawing instruments to demonstrate the skills of drawing and the knowledge of basic 2-D shapes. Apply the skills, knowledge and understanding needed to produce a graphic image using Autocad (or other suitable CAD programme).

Time scale: The full range of learning and assessment activities presented in this exemplar would take four class periods (two doubles). This would also include a single class for a general introduction to everyday patterns.

Potential areas of difficulty

- Observing and interpreting measurements and marking out pattern shapes.
- Lack of dexterity, and poor grip and control of drawing instruments, including a T-square, a compass, pencils, and markers.
- Holding and using pencils to apply colour.
- Short attention span, lack of concentration and application.
- Limited previous knowledge of the subject area.

Strategies used in this exemplar

- Start with simple everyday objects based on squares that help to build up skills of drawing and colouring. Interesting projects, based on squares, rectangles and triangles that require a short timescale should be chosen in the early stages.
- Vary the processes and move students to new and achievable tasks if concentration is seen to flag.
- Students who find it difficult to hold instruments may find using CAD an easier method of achieving an outcome related to a particular design.
- Each new process should be practiced so that each student is confident in a safe working environment.
- Students experiencing difficulty should be observed carefully, and appropriate intervention should be provided as required, for example, using templates to mark out shapes that have complex geometric constructions.

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Resources

- Drawing boards, T-squares, plain A3 and A4 drawing paper, grid paper with light lines drawn in a square box pattern (sizes 5, and 10 mm).
- A selection of colouring pencils and soft markers.
- Examples of patterns designed by other students for students to examine.
- Strong emphasis is needed on safety and building up confidence to participate in the activity-based environment.
- The basic grid used as a foundation should be placed with finished examples so that students get a sense of what has to be achieved. Templates to assist in marking out should be available for students who may find it difficult to control a pencil or may have dexterity limitations.
- A 2-D computer aided design package can be used after students become familiar with the paper and pencil methods. CAD can facilitate students who may have dexterity limitations with the mouse and colour palette allow editing at will. While students should be encouraged to draw their own grid paper, a square grid pattern template will also help make achievement possible for everybody.

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Suggested outcomes	Supporting activities	Assessment strategies
As a result of engaging in these activities students should be enabled to • list safety precautions that should be observed when using drawing equipment and computers • observe and list the patterns they see in their immediate environment • state and list the shapes that each pattern is based on • use prepared grid paper to draw their own patterns based on squares • use templates to assist in the control of pencils and coloured markers • design their own grid pattern • use a 2-D CAD package to draw a grid, insert colours, and create their own patterns.	• Students demonstrate the safe use of drawing equipment and CAD. • Students look at the floors, ceiling and walls of the room and the school building(s) to identify patterns. • Students examine closely basic shapes, such as a square, a rectangle, triangle, a circle, etc. • Handouts of some square and box patterns should be available to students to enable them to draw the shapes using grid paper. • Students use instruments and pre-made templates to give control over drawing and colouring. • The teacher presents achievable design briefs that initially challenge students to use square, rectangular and triangular shapes. • Students participate in CAD procedures on a step by step basis using a computer and a 2-D package.	• The teacher observes whether students can: – talk in pairs through safety points in relation to drawing equipment and, the computer – in pairs, identify and note patterns, and report by talking or sketching – interact with other students and the teacher – identify and name basic shapes – produce their own patterns on paper – participate in and understand the process – use a template in drawing – assess their own patterns according to the design brief – demonstrate dexterity in using instruments and equipment – produce drawings using a CAD package – explain/demonstrate to a teacher/peer how she/he achieved this.

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Activity 1

Safety

The purpose of this activity is to introduce students to the activity-based environment. It is likely that this will be totally new and may be an overwhelming experience for them.

It presents many opportunities for them to access areas of education that they might never experience otherwise.

Students have a natural curiosity and like to explore new situations. This curiosity should be nurtured and it is important that natural curiosity wonder and awe are not dampened by long lists of do's and don'ts. This is relevant to all activities and it may be necessary to have assistants to help if the students' learning disabilities or class sizes demand it.

Personal safety

Students love to be involved and it is vital that the teacher demonstrates safety procedures using instruments and that students practice each routine. It should be clear to every student that there is no running allowed in the workshop.

When using a computer for CAD it is important that students are seated properly and that screen brightness and resolution are adjusted correctly.

Activity 2

Observation and classification

Students walk about the room and the school with a notebook and pencil to identify patterns, make freehand sketches, and classify them according to their basic shapes.

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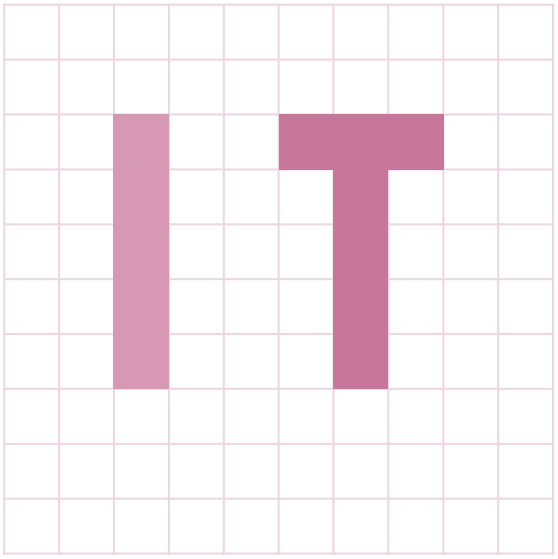
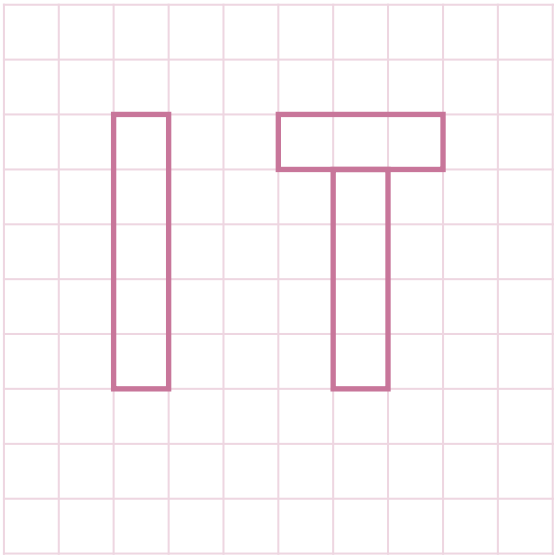
Activity 3

Draw from given patterns

Students are shown how to identify the position of patterns from handouts, and they transfer these to grid paper.

The letters *'IT'* can be easily identified and translated to blank grid paper by first outlining the general shapes and finishing them with any colour the students choose.





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Activity 4

A design based on patterns

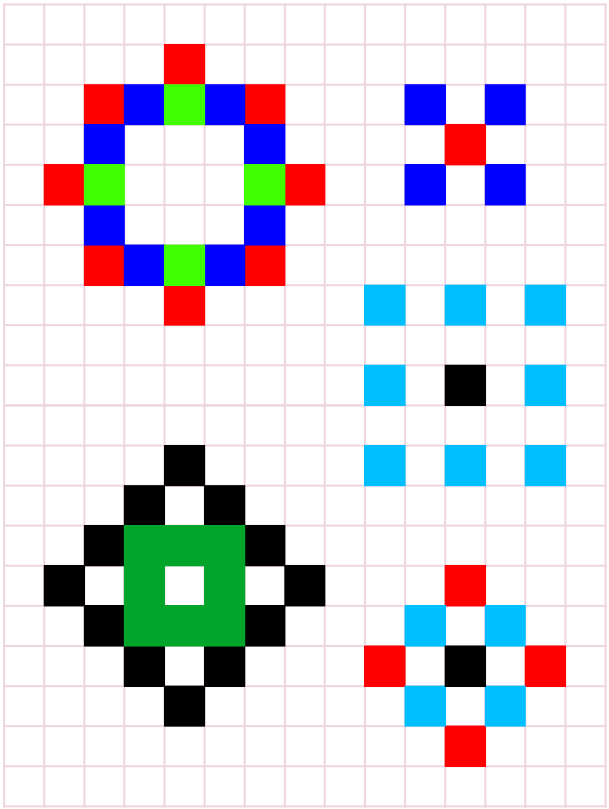
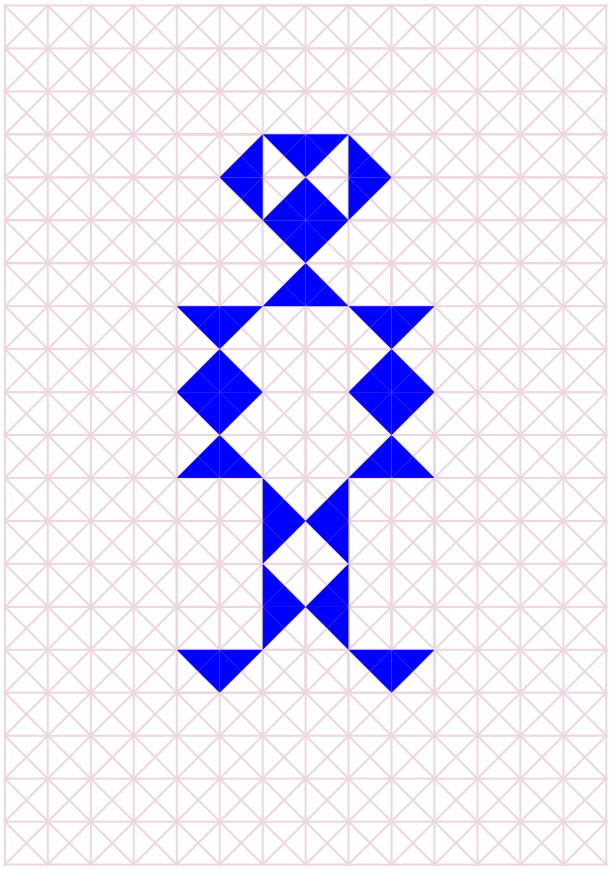
Brief A

Design and draw five patterns based on squares on a 10mm A4 grid paper. The pattern should be coloured when finished.

Discuss a suitable application for each pattern.

Brief B

Design and draw a robot based on squares, or a combination of squares and triangles, on a 10mm A4 grid paper. The pattern should be coloured when finished.

Discuss a suitable application for each pattern	
Design A	Design B
	

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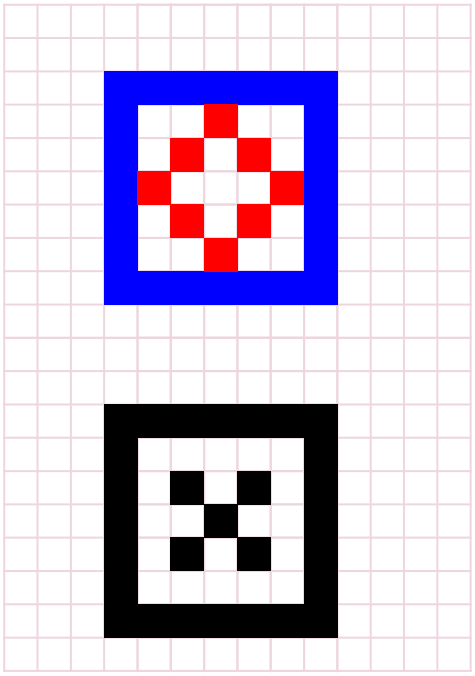
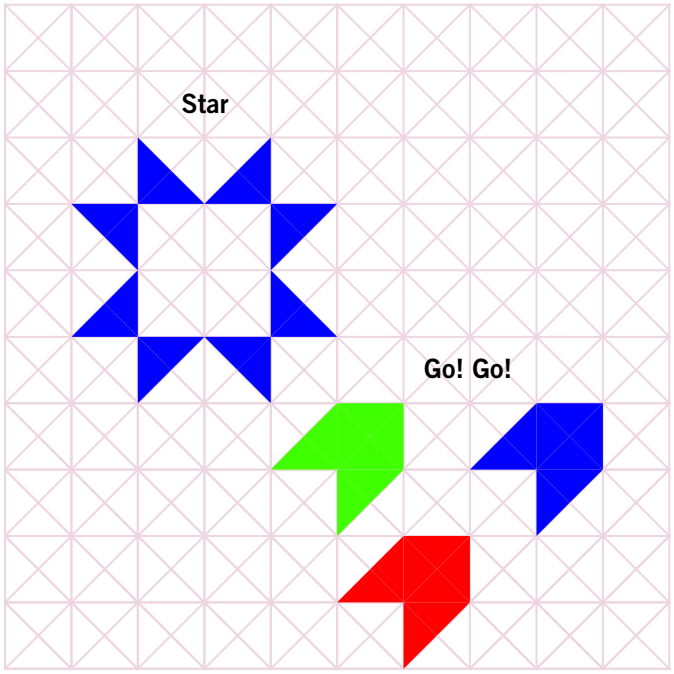
Alternative designs





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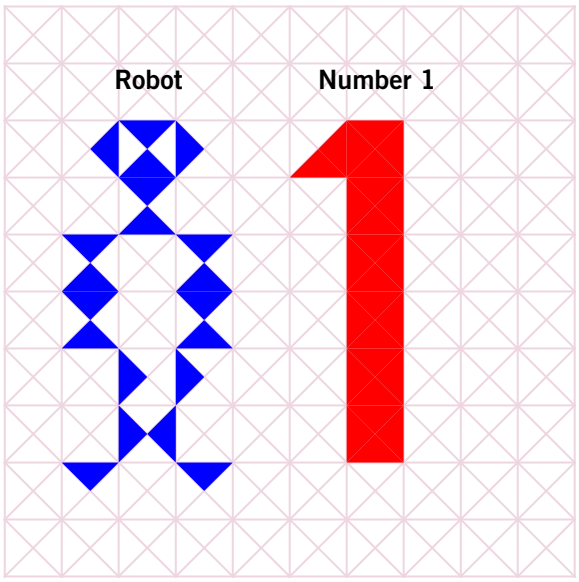
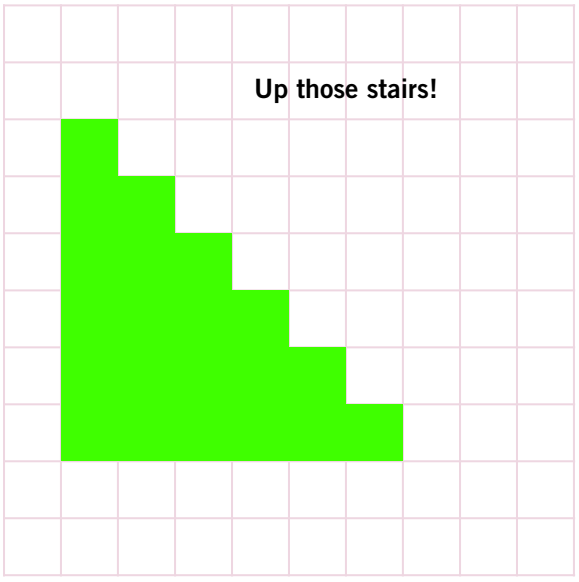
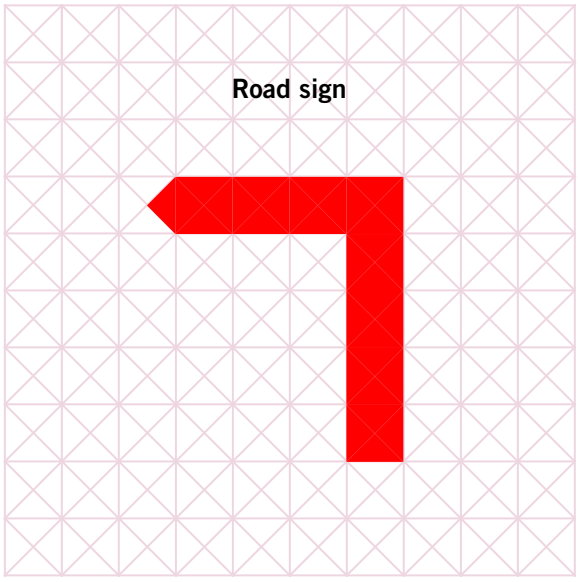
Floor and wall tiles







Exemplar 7: **Technology Education**

Syllabus topic: Technical graphics: Descriptive geometry	Orthographic projection

Primary School Curriculum (5th and 6th classes)	Junior Certificate (Ordinary level)	Junior Certificate School Programme
Science **Skills Development:** Working scientifically Designing and making **Visual Arts** Strand: Drawing Strand units: Making drawings Looking and responding Strand: Paint and colour Strand unit: Looking and responding Strand: Construction Strand unit: Making constructions **Mathematics** Shape and space	3.3.1 Orthographic projection 3.4.1. Freehand drawing and sketching	Apply the knowledge and skills of drawing needed to understand the design and construction of 3-D objects.

Time scale: The full range of learning and assessment activities presented in this exemplar may take up to eight class periods.

Potential areas of difficulty

- Spatial awareness (difficulty with organizing workspace, visualising objects, recognising of different shapes, and constructing plane figures).
- Co-ordination (difficulty with gross and fine motor skills).
- Understanding concepts, such as *elevation*, *plan* and *end elevation*, positioning each view for orthographic.
- Applying previously learned knowledge (concepts and drawing techniques to those already learned).
- Language (understanding keywords, such as *orthographic*, *elevation*, *plan*, *end elevation*).
- Short attention span and lack of concentration and application.
- Transferring knowledge and skills to real life (visualising the basic geometric shapes in each view and understanding the relationship of the 2-D representation to the 3-D object).
- Visual sequencing problems (hand eye co-ordination, copying from the board, achieving a standard of presentation).
- Calculation.

Exemplar 7: **Technology Education**

Strategies used in this exemplar

- Providing access to concrete models and real life objects relevant to students experience.
- Practising the concept of *orthographic projection* through a variety of approaches.
- Using key words supported by graphic illustration on display in the room.
- Using colour to aid visualisation.
- Setting modular measurements.
- Using measurement aids as appropriate.
- Using templates as appropriate.
- Encouraging students to use relevant technical terminology.
- Using appropriate ICT resources, such as parametric modelling.
- Referring to previously learned knowledge.
- Encouraging students to use the sense of touch.
- Making cross curricular links to Materials Technology (Wood), Materials Technology (Metal), Mathematics.

Resources

- Normal technical drawing student equipment.
- Tools for measuring, such as rulers, card, templates, and tracing paper.
- Hinged planes of reference models.
- Sets of models for each exercise.
- A parametric model of each exercise.
- Activity sheets as listed.

Exemplar 7: **Technology Education**

Suggested outcomes	Supporting activities	Assessment strategies
As a result of engaging in these activities students should be enabled to • understand the concepts of planes of reference, and projection to planes of reference • have a basic understanding of the concept of *orthographic projection* in first angle, visualising each view from differerent view points and the relative position of each view • gain practice in visualising 2-D representations of 3-D objects • identify basic geometrical shapes in their environment • use basic measuring equipment and techniques • construct geometric shapes • gain practice in using technical drawing equipment and in freehand sketching • appreciate the use of colour and shading as a technique • learn and use conventions in relation to orthographic projection and dimensioning.	• Students are introduced to the concept of viewing a solid object from the front, top and side, and representing what is seen as a 2-D shape. • Students partake in activities introducing them to planes of reference and in discussions and demonstrations about projection to these planes. • In engaging with an orthographic projection of a dice students draw the elevation, plan and end elevation/s of a solid and take part in structured discussion as to which direction to look to obtain each view, the shapes and sizes seen in each view, and the relative positioning of each view. • Engaging with an orthographic projection of a house. • Reinforces the concepts above through the completion of the orthographic projection of a further solid. • Students are encouraged to visualise/recognise common objects from given orthographic views. • Students work in pairs or small groups and draw. • Free-hand orthographic views of common objects. Other students in the group identify the objects. **Differentiation:** suggestions for differentiation are included with each activity. **Cross-curricular links:** these skills can be reinforced if similar concepts in Technology, Materials Technology (Wood), and Materials Technology (Metal) are treated at the same time.	• Each activity sheet can be used for assessment. The relevant sheets should be kept in the students' drawing folders. • As students engage in activities and discussion relative to planes of reference the teacher can assess their ability to participate, to manipulate the planes of reference models in group activity, to understand and describe what is seen in each view, and the position of each view. • The teacher observes whether students can: – manipulate the drawing equipment effectively – draw accurately – visualise each view – achieve neatness in drawing, in colour, and in shade – achieve reasonably proper proportion in freehand drawing activities – complete each activity in a reasonable time – use appropriate terminology when commenting/asking questions. • The teacher observes the amount of support required in each task from the teacher/from others in the group. • The teacher observes: – the degree of student self and task evaluation – how much revisiting/ rechecking the student engages in – the stage at which the student is satisfied that task is fully completed.

Exemplar 7: **Technology Education**

Activity 1

Orthographic projection—introduction

Drawing a Dice

The purpose of this activity is to introduce students to the basic concepts associated with orthographic projection.

The teacher initiates a structured discussion of how solid objects are represented in drawing.

Examples of 3-D representations of solids are discussed first. The examples discussed should be reasonably basic in detail and relevant to the student's experience, for example, common objects from the home, the classroom, or exercises from technology subjects. The 3-D representations of each example may be sketched on the board or students may be encouraged to find examples in their textbooks. The teacher elicits from the students that height, width and depth are to be seen in each 3-D drawing.

The teacher introduces examples of orthographic representations of some common objects that the students should recognize, for example, the combined elevation, plan, and end elevation of a house, a television, a cooker, and a mobile phone. In each case the teacher asks the students to name the object and elicits which direction to look to obtain each view, that two dimensions only are seen in any view (height and width in elevation, etc.), and that the three views, together, constitute the orthographic drawing.

The teacher may demonstrate the realisation of the orthographic projection of a cube using the planes of reference model to show how each view is obtained by projection from the solid, by drawing each view on the plane of reference, rebatting the planes to help the students visualisation, and to help them understand the positional context of each view.

ICT resources may be used as an alternative or as a reinforcement of the above. Parametric modelling software, such as Solid Edge, Solid Works, or Inventor may be appropriate, and animated demonstrations of projection to planes as those in *Technical Graphics teacher resources* at www.scoilnet.ie may be useful.

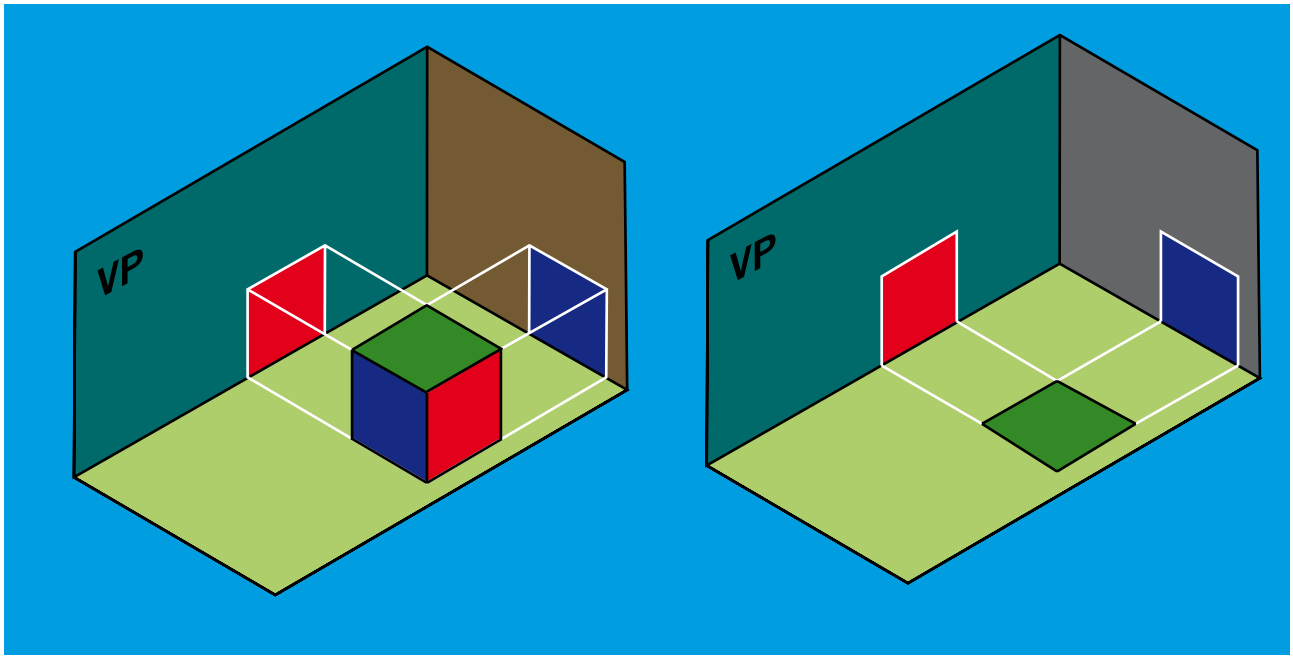
Students working in pairs or small groups, each pair/group using a model of the cube and reference planes, may help to reinforce concepts. Students project each corner of the solid to the reference planes (covered with a sheet of folded drawing paper), and when it is complete they unfold the paper to show the orthographic. Students should be encouraged to use their sense of touch in manipulating solid models. They may be helped in this by having different colours/textured material on different faces of the solid, for example, fine sandpaper on one face, etc.

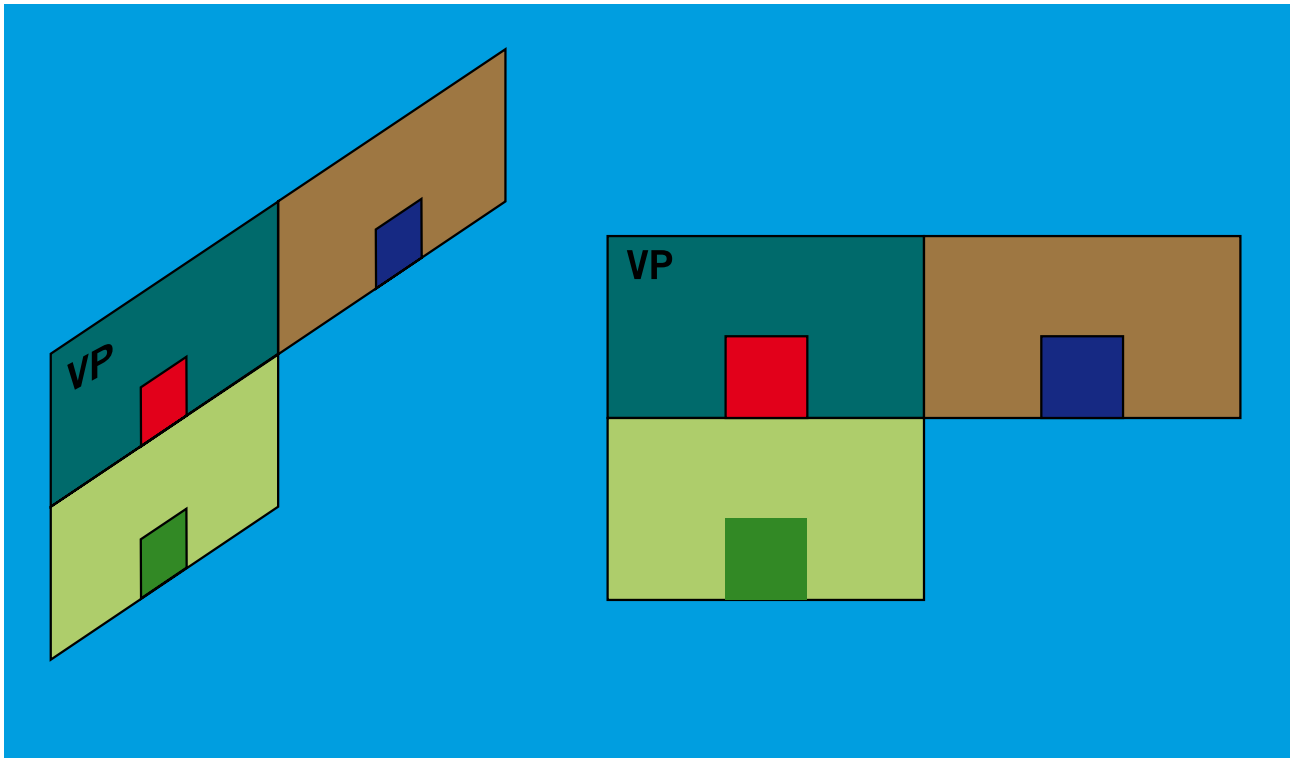
Use of terms

Students are encouraged to use relevant terms and in the initial exercises the teacher may help by repeating an explanation each time a term is used, for example, *'The elevation, that is, the view seen looking in at the front'*.

Simplified terms, for example, using the wall in conjunction with the vertical plane or the ground in conjunction with the horizontal plane may also help.

Exemplar 7: **Technology Education**





Exemplar 7: **Technology Education**

Students engage in drawing the elevation, plan and end elevation of a dice (*Activity sheets 1*).

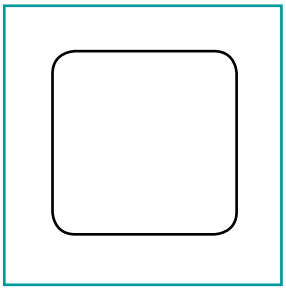
Students may use models of the dice in conjunction with models of reference planes in small groups to decide each view. Alternately this could take the form of a whole class discussion.

Differentiation can be accommodated by:

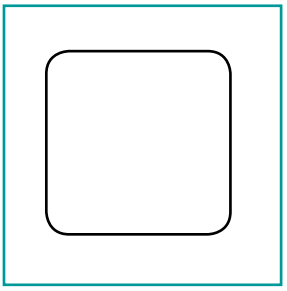
- encouraging students to work co-operatively in pairs
- allowing for different drawing methods, for example, some students using a compass to draw circles, others using circle templates provided, or a student with dexterity problems drawing under the instruction of another student
- different ways of measuring, for example, some students using a ruler to measure, and others using card strips to mark and transfer distances to the activity sheet
- different methods of construction, for example, some students drawing diagonals or using bisection to find the centre of a square and others being assisted or encouraged to use tracing paper to transfer key points
- allowing students to progress at their own pace
- providing additional sheets in the same exercise to allow students to draw the dice in different orientations (these additional sheets may also be used for assessment)
- allowing for different interpretations of the completed task, for example, fully dimensioned/the drawings to standard from some students/and a specified number of dimensions from others
- varying the design of the activity sheet, for example, allowing for one end elevation (as in *Activity sheet 1*), or allowing for both end elevations and/or not including an outline of one or all views.

Exemplar 7: **Technology Education**

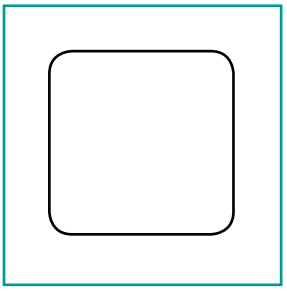
Orthographic projection—a dice



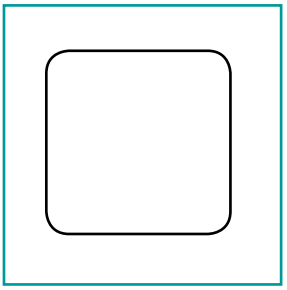
End Elevation
Look at _____ side



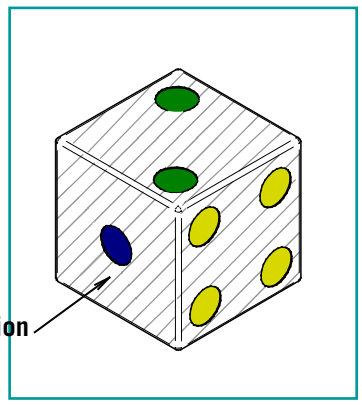
Elevation
Look at _____

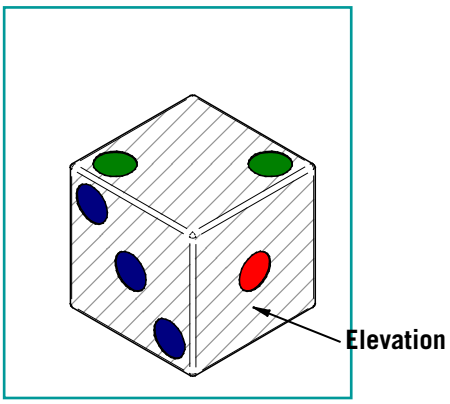


End Elevation
Look at _____ side



Plan
Look at _____





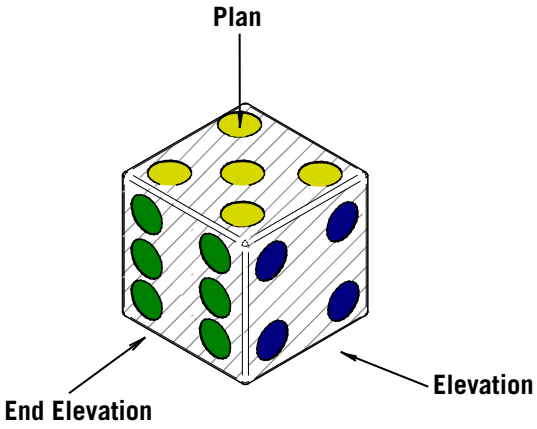
Exemplar 7: **Technology Education**

Look at the model and position the spots correctly in each view.

End Elevation
Look at _____ side

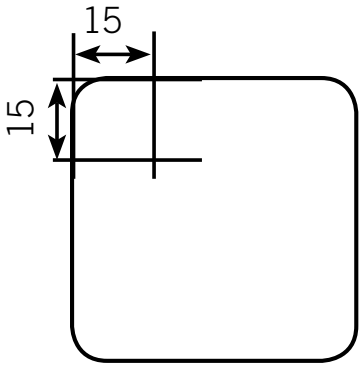
End Elevation
Look at _____ side

Plan
Look at _____

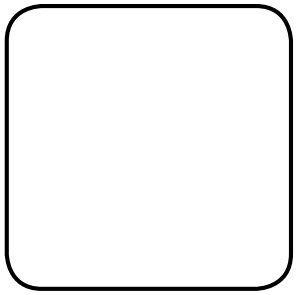


Exemplar 7: **Technology Education**

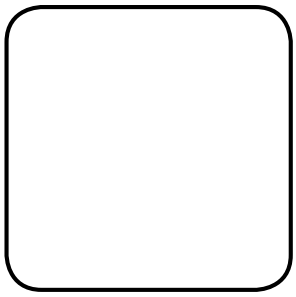
Look at the model and position the spots correctly in each view. Dimension the drawing and apply colour and shading.



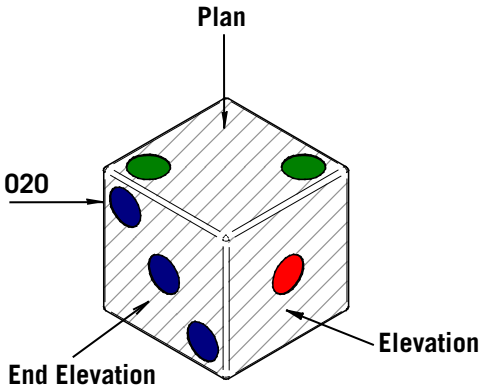
End Elevation
Look at _____ side



End Elevation
Look at _____ side



Plan
Look at _____



Exemplar 7: **Technology Education**

Activity 2

Drawing a house

The purpose of this activity is to reinforce the concepts already learned and to allow students gain further practice in orthographic drawing.

Concrete models of the house and reference planes may again be used in this exercise. A number of sets of models may be useful to allow for single student or small group activity. Concepts relating to orthographic projection may be reviewed, for example, *'What views may we draw?'*, *'Which direction must we look to obtain the elevation/plan/end-elevation?'*. A second end elevation may be discussed through using questions such as '*What features of the house may be seen in each view?'*, *'Where should each view be placed in relation to other views?'*.

Strategies relating to classroom management, ICT resources, student use of models (including colour and material texture), and the use of relevant terms may be used, reviewed and progressed from *Activity 1*, as appropriate.

Differentiation can be accommodated by:

- encouraging pairs or groups of students to be responsible for the finished drawing, bearing in mind the students' learning strengths when assigning roles
- allowing for different techniques as in *Activity 1*, for example, allowing some students to use a compass, ruler, etc. in considering various constructions while encouraging others to use a circle template, modular templates (pre-prepared plastic strips 20mm and 30mm wide) or tracing paper
- varying task completion times by providing different task sheets, for example, including only elevation and plan on one task sheet, and including one or both end elevations on another
- allowing for different completion targets, for example, expecting some students to complete the task as set out, while encouraging others to add further details, such as 4-paned windows, lines to indicate roof tiles, etc.

Note: Allowing students to add further features/details as above, or encouraging students to choose their own colour schemes may aid task engagement and commitment.

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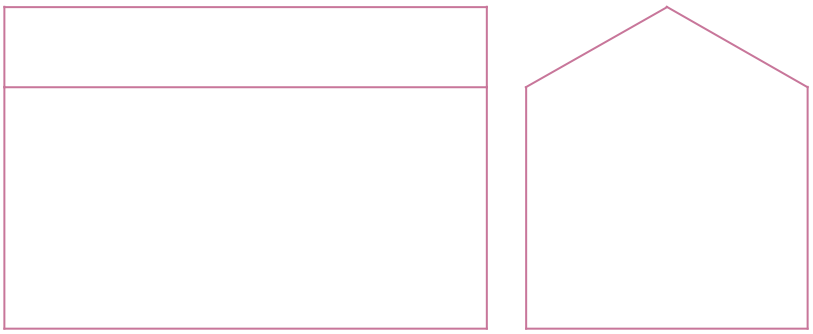
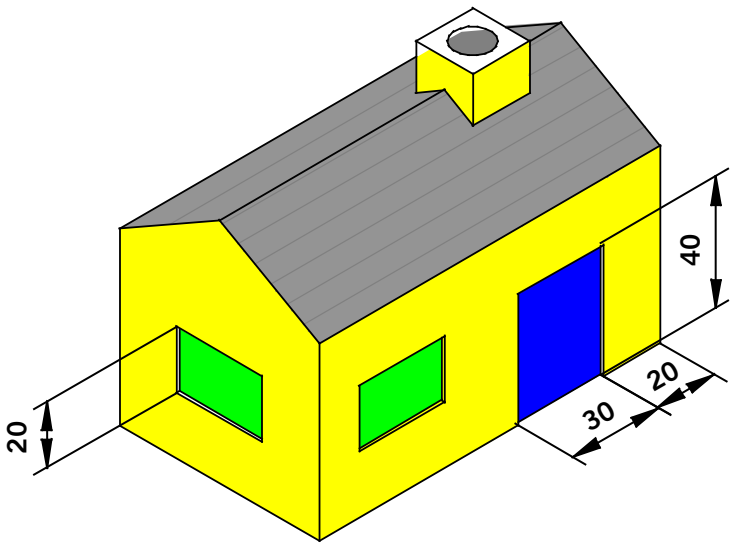
Activity sheet 2

- Print title and name each view.
- Complete each view.
- Add dimensions.
- Colour and shade.





Exemplar 7: **Technology Education**

Activity 3

Orthographic projection

Freehand sketching

The purpose of this activity is to consolidate the students' knowledge of orthographic projection and to allow them to gain practice in freehand drawing.

Computer generated 3-D Parametric models of the television can and may be used to facilitate class discussion. Alternately a real life model of a tin can or of a cylinder may be used in conjunction with reference planes if concept review is necessary. In this exercise students may be prompted to suggest which are the more appropriate views. Looking at the screen is the most appropriate elevation for the television. Is the end elevation required in each case or does the elevation and plan alone provide enough information?

Students may be expected to decide independently which views and orientation to use.

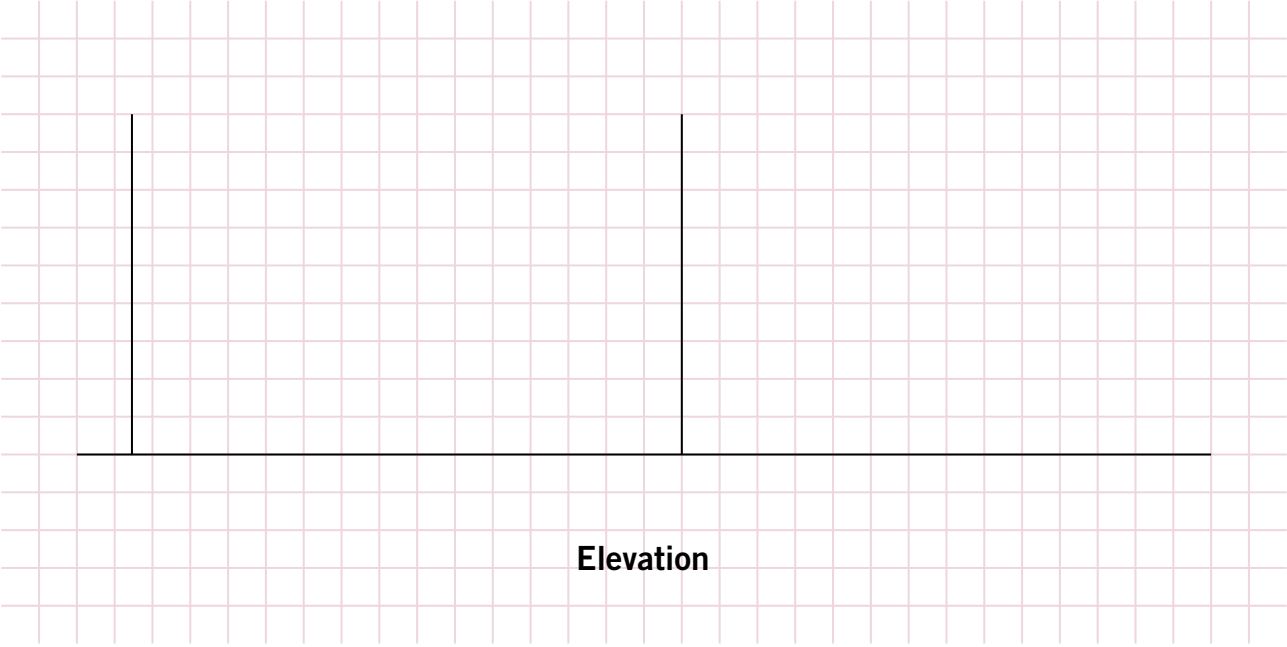
Allowing students to customize their drawings may again be an effective strategy.

The student's sketch of the elevation of the can (cylinder) may give a particular assessment insight, since the student may readily perceive/accept the edge view of square surfaces but may show top and base edges as curves in this instance.

Note: Frequent concept review may be especially important in a subject such as Technical Graphics, which the students may meet only once or twice a week, to provide adequate lesson-to-lesson continuity.

Differentiation can be accommodated by:

- allowing for different outcomes, for example, expecting some students to draw the elevation and plan only, others to draw these and one or both end elevations, and not expecting all students to include fine detail
- varying the design of the Activity sheet by providing hint lines on the sheet to help students who may find freehand drawing difficult.

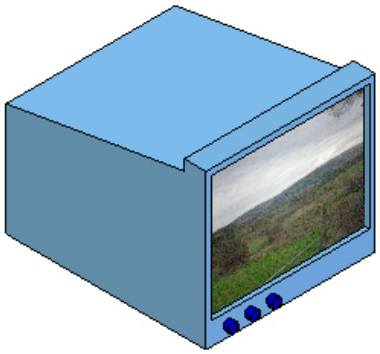


Exemplar 7: **Technology Education**

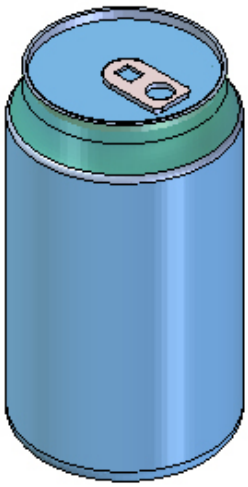
Activity sheet 3

Orthographic projection

- Draw neat well proportioned freehand sketches of the television and drink can shown using orthographic projection.
- Print the title of each view neatly.
- Decide which colours you would like your television to be and colour each view.
- Colour and shade the orthographic views of the can to indicate your favourite soft drink.



Exemplar 7: **Technology Education**



Exemplar 7: **Technology Education**

Activity 4

Name the object

The purpose of this activity is to reinforce and to assess the student's knowledge of the concept of orthographic projection.

In the first part of the activity the students are asked to study the orthographic views of each object and name them. Questions which may help to deepen the students' understanding of orthographic views include:

- In the first drawing (of the steps) is the end elevation necessary?
- Why is it necessary?
- What would the other end elevation look like?
- In the second drawing (of the setsquare) is the end view necessary?
- Why/why not?
- In the third drawing (of the sphere) what is the technical name for this solid?

In the second part of the activity the students are asked to draw orthographic views of a common object and see if others in the group/class can recognize the object. This exercise may give students further practice in visualization and in making decisions as to which is the most sensible view to include as an elevation.

The teacher or students may draw orthographic views of other common objects on the board to continue the exercise/game.

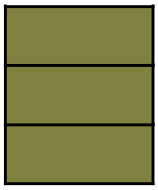
Differentiation can be accommodated by:

- allowing for different outcomes, for example, some students writing the answers to the first part of the exercise independently, others choosing to illustrate the answers graphically or choosing and copying the correct answer from a list provided, or students working in pairs or small groups to complete the drawing, with roles assigned according to the students' strengths
- allowing for different inputs, for example, the teacher suggesting different objects that he/she considers are within the students' capability to draw, helping students to visualise objects not present, suggesting objects that the student can see.

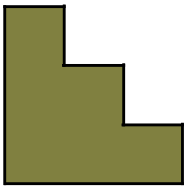
Exemplar 7: **Technology Education**

Activity sheet 4

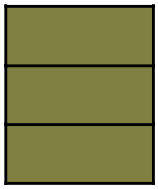
The orthographic projection of three different objects are shown. Look at the views shown of each one and see if you can name what it is.



Elevation

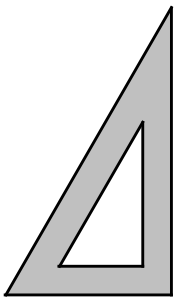


End elevation



Plan

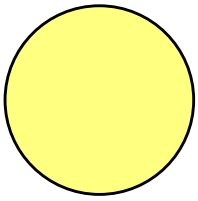
This is a…



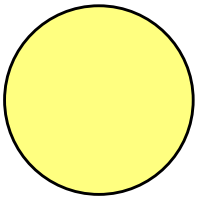
Elevation

Plan

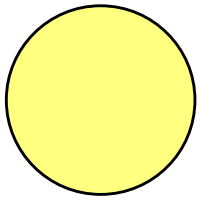
This is a…



Elevation



End elevation

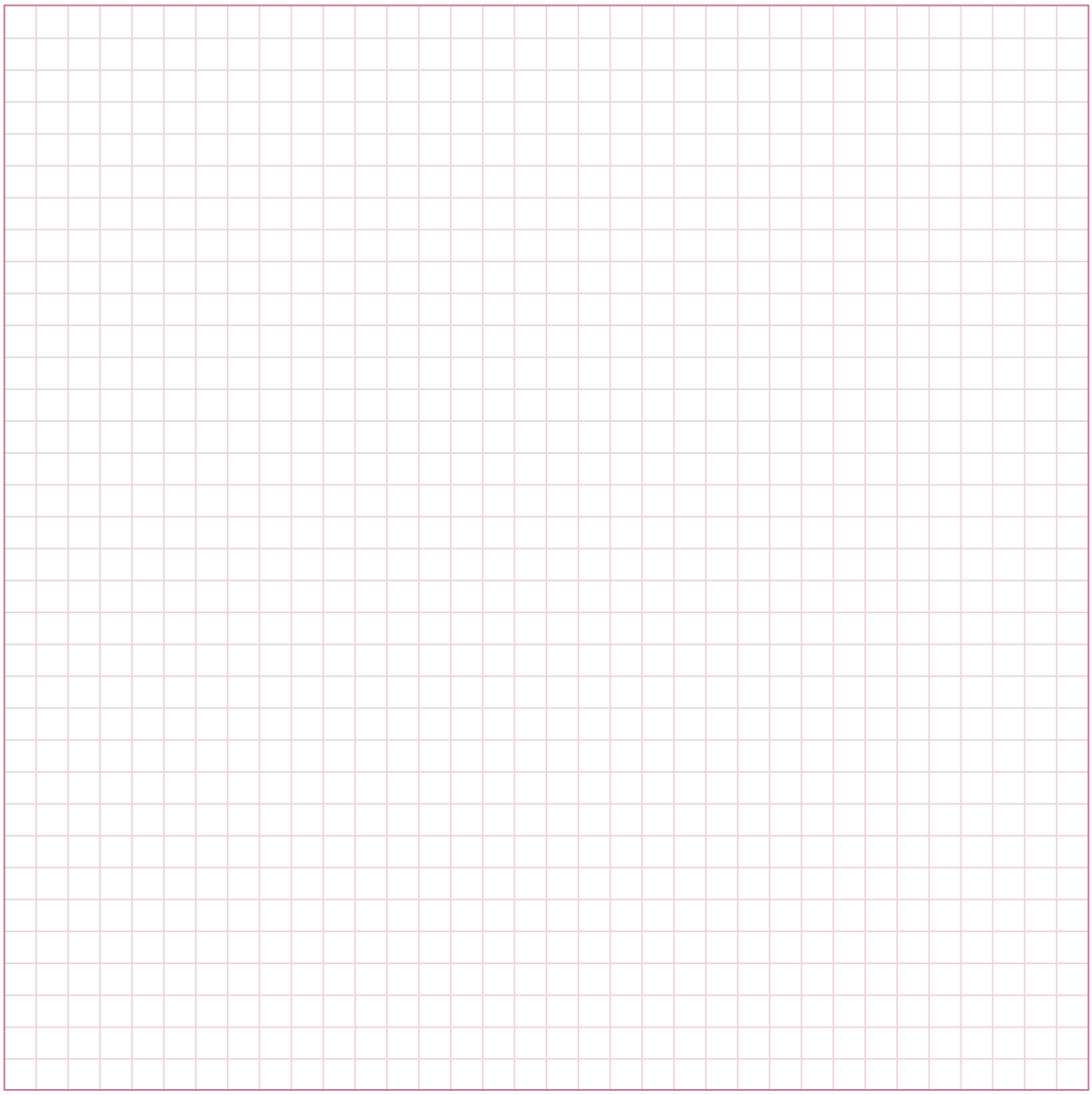


Plan

This is a…

Draw the elevation and plan or the elevation plan and end elevation of an object of your choice in the space provided below. Title each view. Will other people recognise this object?

Exemplar 7: **Technology Education**



What object did you draw? _____

Did the others recognise what it was? _____